FIG. 1

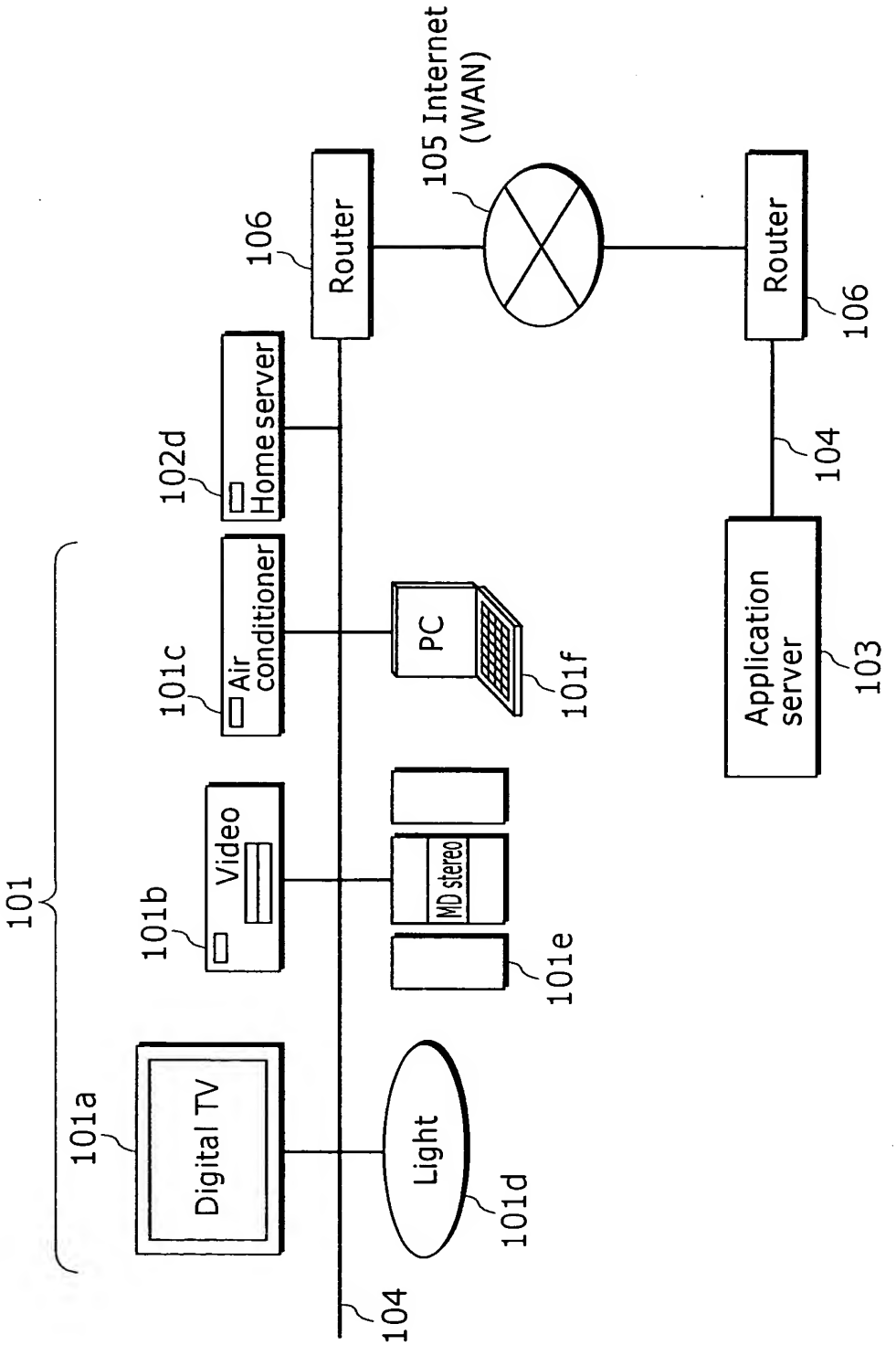
101
101a
Digital TV
101b
Video
101c
Air conditioner
102d
Home server
106
Router
105 Internet (WAN)
Router
106
104
Application server
103
PC
101f
MD stereo
101e
Light
101d
104

FIG. 2

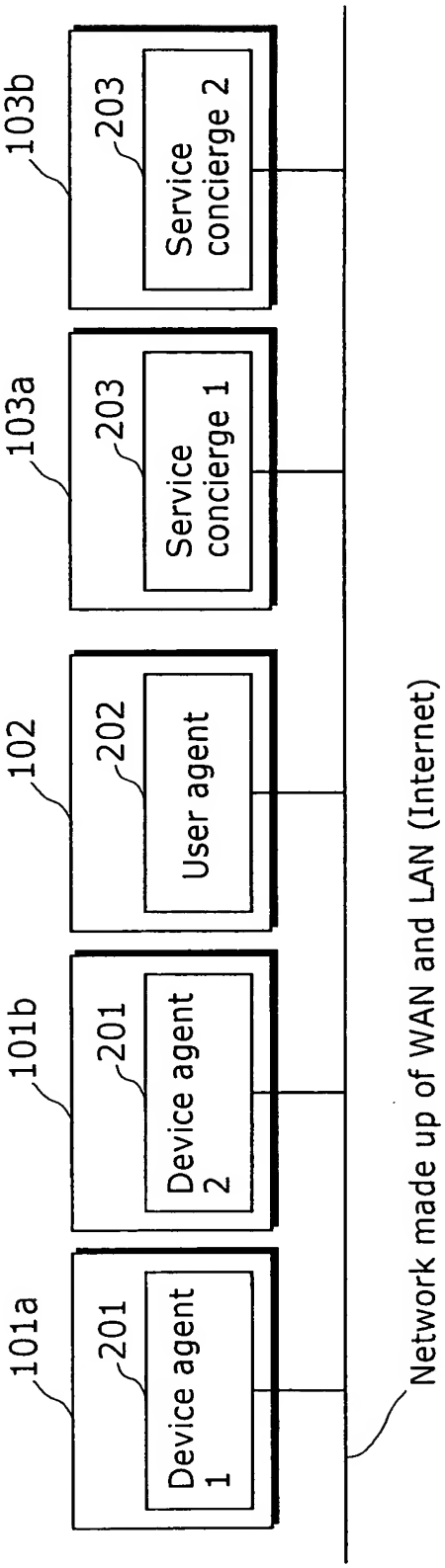
101a
201
Device agent 1
101b
201
Device agent 2
102
202
User agent
103a
203
Service concierge 1
103b
203
Service concierge 2
Network made up of WAN and LAN (Internet)

FIG. 3

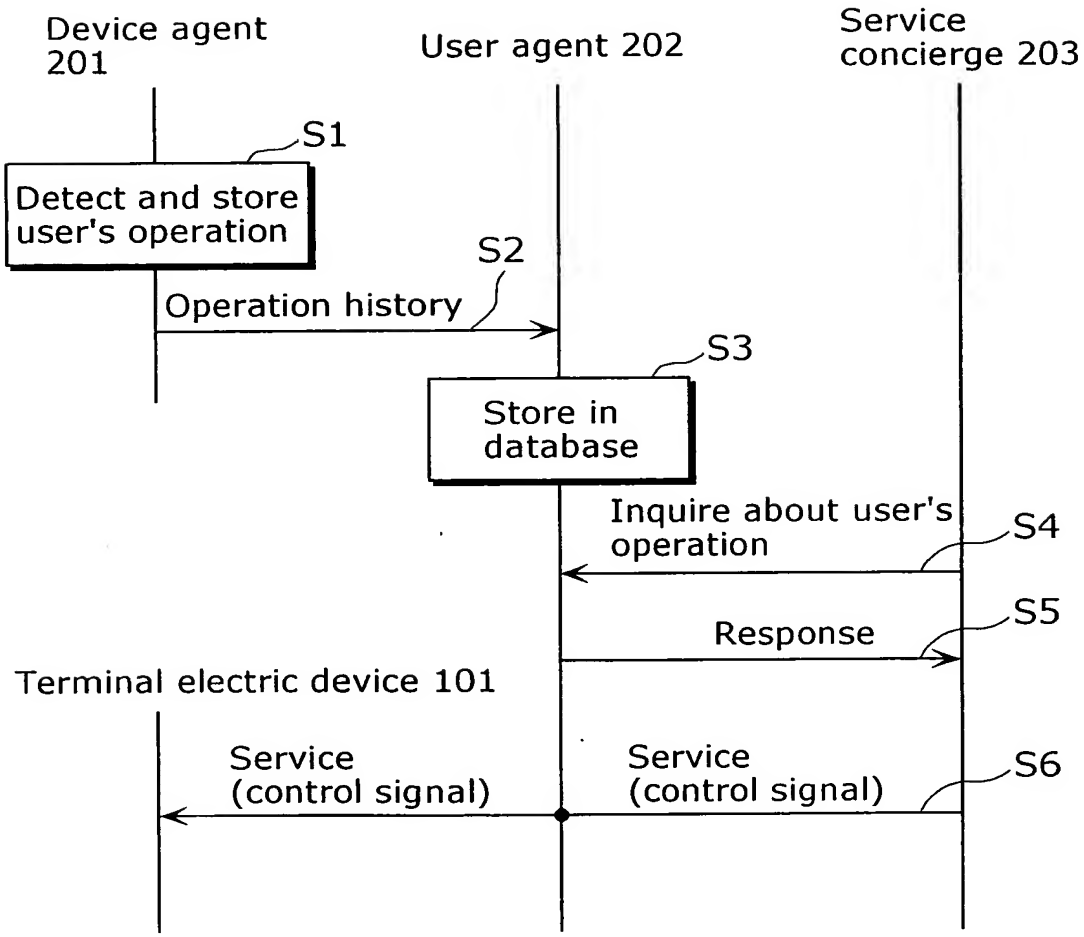
Device agent 201
User agent 202
Service concierge 203
S1
Detect and store user's operation
S2
Operation history
S3
Store in database
Inquire about user's operation
S4
Response
S5
Terminal electric device 101
Service (control signal)
Service (control signal)
S6

FIG. 4

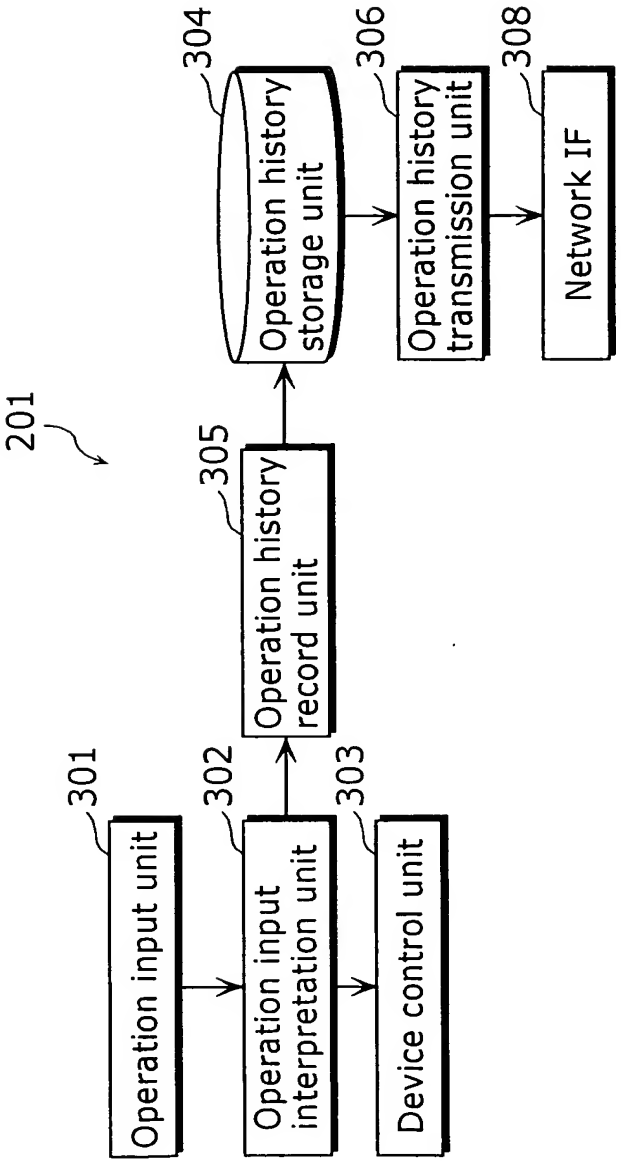
201
301
Operation input unit
302
Operation input interpretation unit
303
Device control unit
304
Operation history storage unit
305
Operation history record unit
306
Operation history transmission unit
308
Network IF

FIG. 5

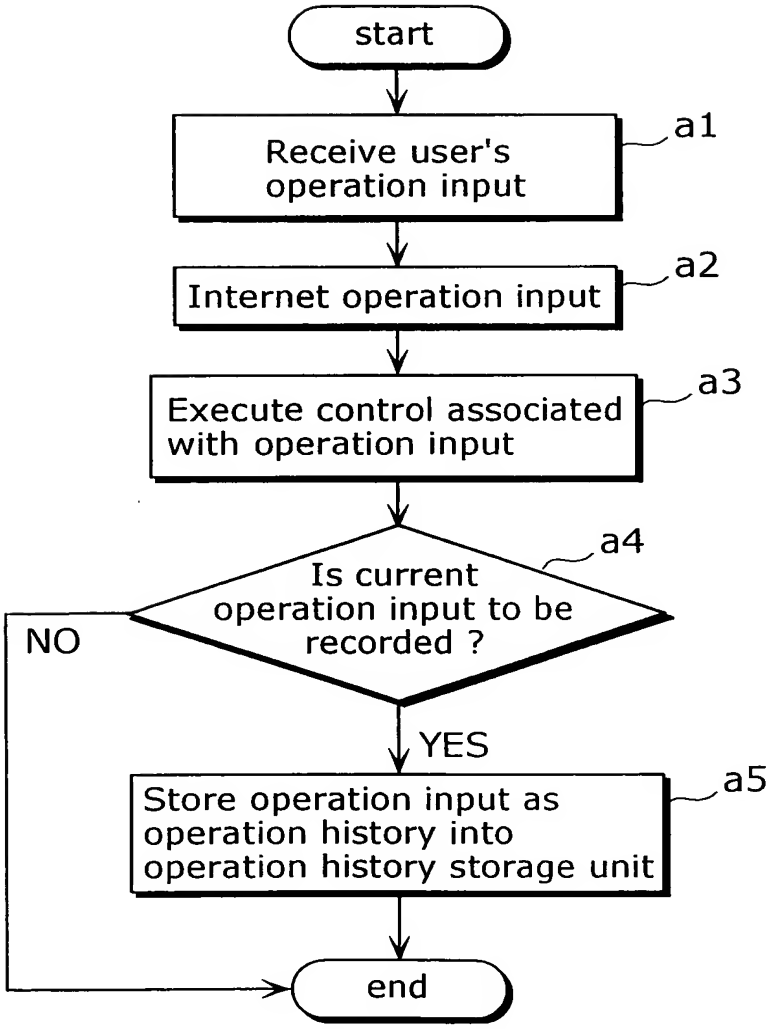
start
Receive user's operation input
a1
Internet operation input
a2
Execute control associated with operation input
a3
Is current operation input to be recorded ?
a4
NO
YES
Store operation input as operation history into operation history storage unit
a5
end

FIG. 6

Device type	Operation type	Operation type specific identifier
TV	Power On	PowerOn
	Power Off	PowerOn
	Volume Up	VolUp
	Volume Down	VolDown
	Change channels	Play
	...	...
VIDEO	Power On	PowerOn
	Power Off	PowerOff
	Play	Play
	Stop	Stop
	Record	Record
	Reserve	Reserve
	...	...
Air Conditioner	Power On	PowerOn
	Power Off	PowerOff
	Temperature setting	Set
	Air volume setting	Set
	Stop	Stop
	Reserve	Reserve
	...	...
...	...	...

FIG. 7

(Example 1)

Operation date and time	Device type	Operation type specific identifier	Argument
2002/08/29 11:00	Air Conditioner	Set	27

(Example 2)

Operation date and time	Device type	Operation type specific identifier	Argument
2002/08/30 18:00	TV	Play	ID:XXXXXXX

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FIG. 8

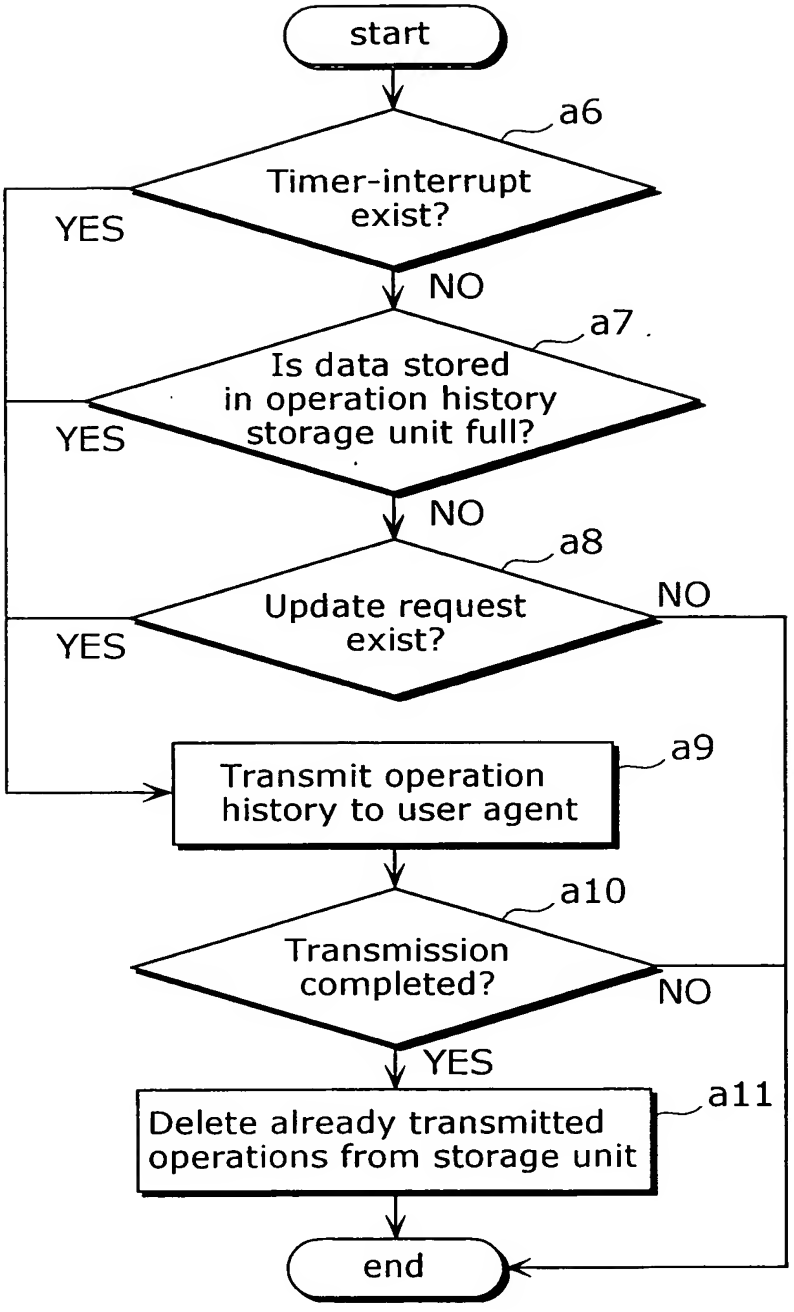

start
a6
Timer-interrupt exist?
YES
NO
a7
Is data stored in operation history storage unit full?
YES
NO
a8
Update request exist?
YES
NO
a9
Transmit operation history to user agent
a10
Transmission completed?
NO
YES
a11
Delete already transmitted operations from storage unit
end

FIG. 9

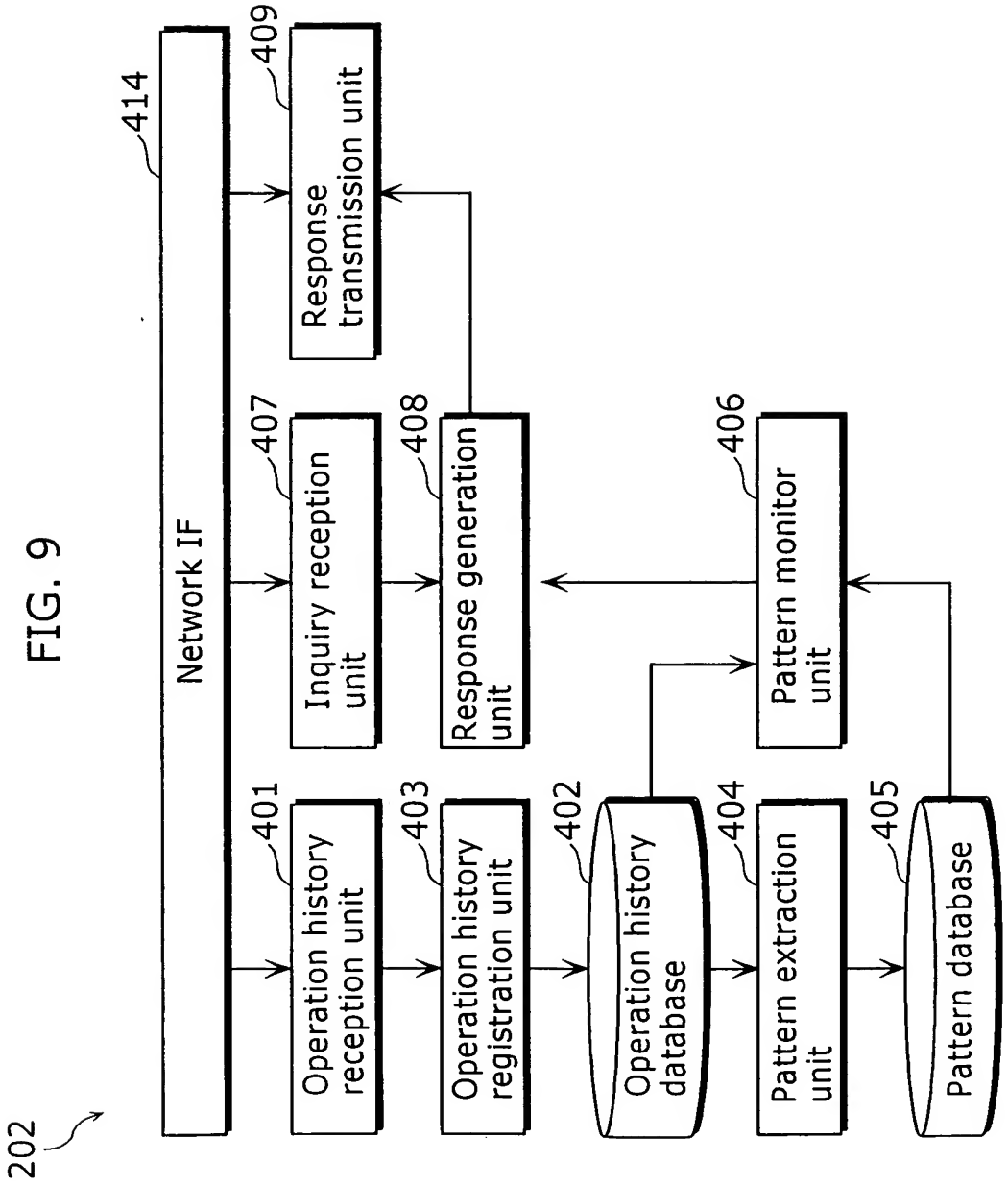

202
Network IF
414
Response transmission unit
409
Inquiry reception unit
407
Response generation unit
408
Pattern monitor unit
406
Operation history reception unit
401
Operation history registration unit
403
Operation history database
402
Pattern extraction unit
404
Pattern database
405

FIG. 10

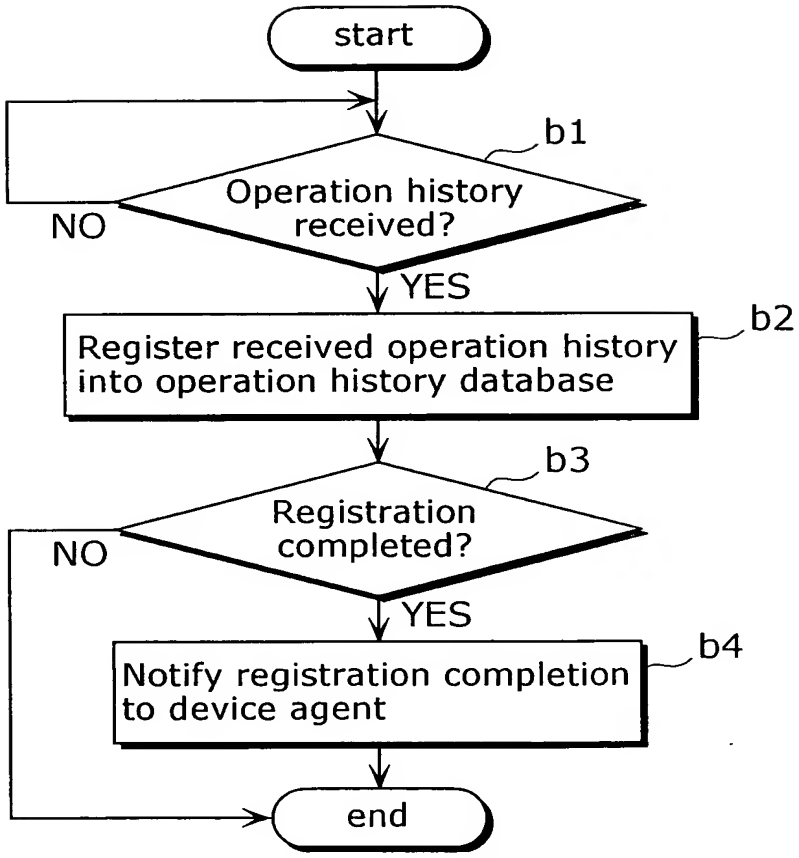
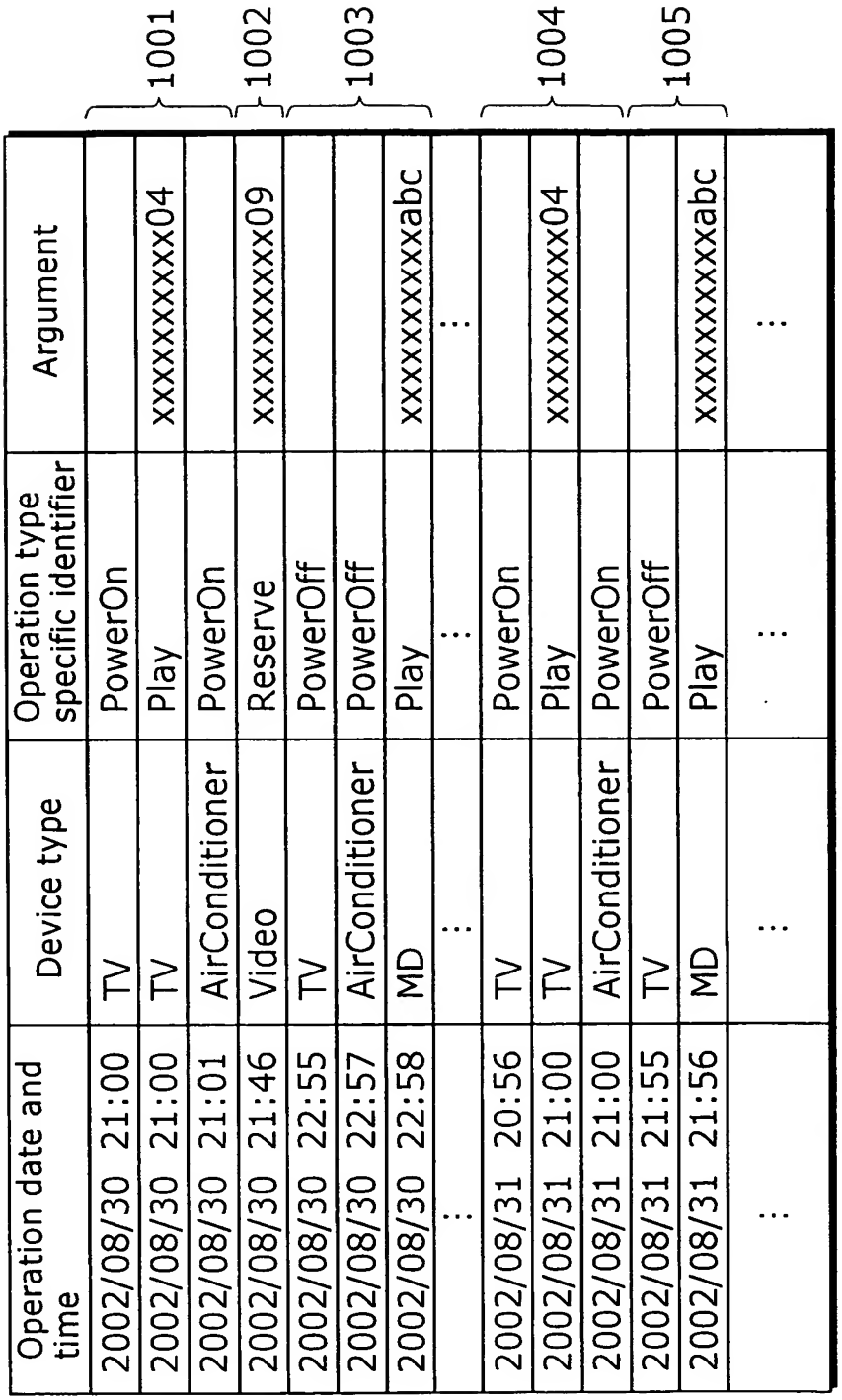

start
b1
Operation history received?
NO
YES
Register received operation history into operation history database
b2
b3
Registration completed?
NO
YES
Notify registration completion to device agent
b4
end

FIG. 11



Operation date and time	Device type	Operation type specific identifier	Argument	
2002/08/30 21:00	TV	PowerOn		1001
2002/08/30 21:00	TV	Play	xxxxxxxxxx04	
2002/08/30 21:01	AirConditioner	PowerOn		1002
2002/08/30 21:46	Video	Reserve	xxxxxxxxx09	
2002/08/30 22:55	TV	PowerOff		1003
2002/08/30 22:57	AirConditioner	PowerOff		
2002/08/30 22:58	MD	Play	xxxxxxxxxxabc	
...	...	...	...	
2002/08/31 20:56	TV	PowerOn		1004
2002/08/31 21:00	TV	Play	xxxxxxxxx04	
2002/08/31 21:00	AirConditioner	PowerOn		1005
2002/08/31 21:55	TV	PowerOff		
2002/08/31 21:56	MD	Play	xxxxxxxxxxabc	
...	...	...	...	

FIG. 12

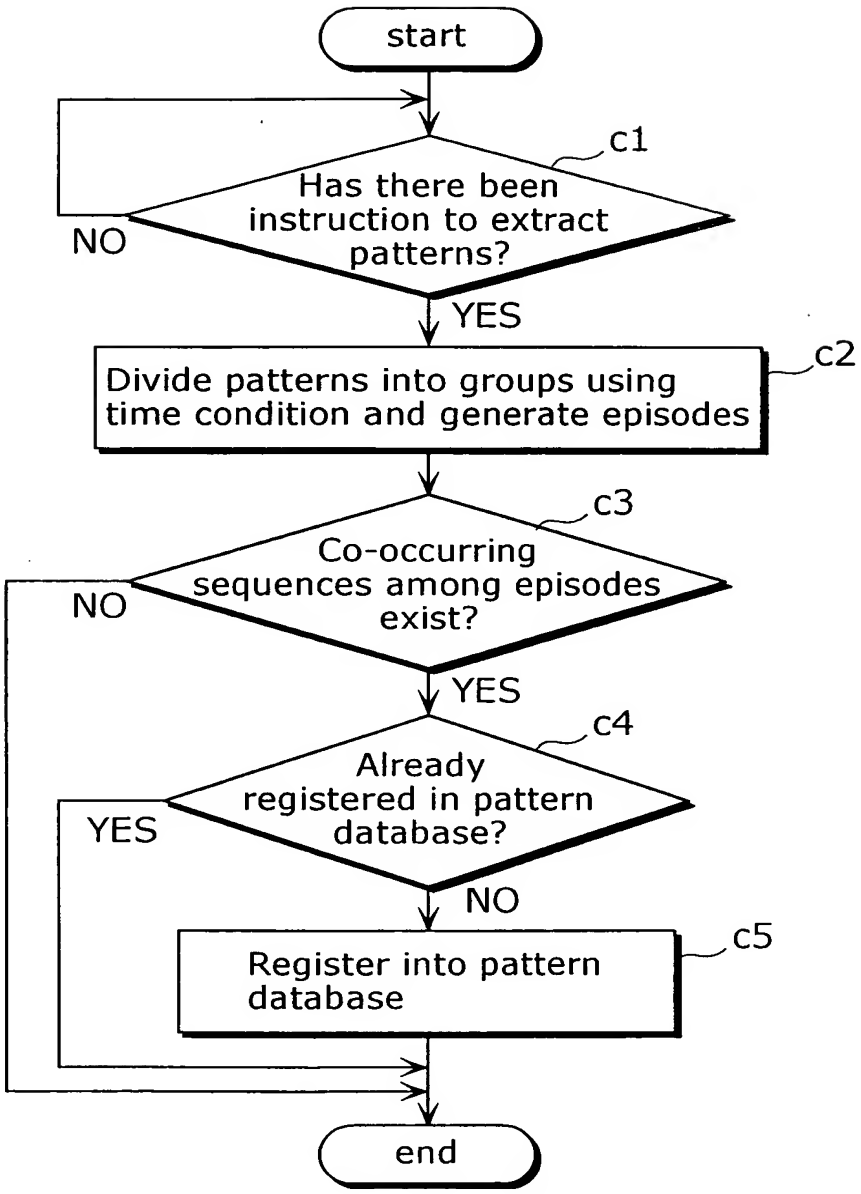

start
c1
Has there been instruction to extract patterns?
NO
YES
Divide patterns into groups using time condition and generate episodes
c2
c3
Co-occurring sequences among episodes exist?
NO
YES
c4
Already registered in pattern database?
YES
NO
Register into pattern database
c5
end

FIG. 13

Episode	Operation sequence
1001	TV-PowerOn, TV-Play, AirConditioner-PowerOn
1002	Video-Reserve
1003	TV-PowerOff, AirConditioner-PowerOff, MD-Play
1004	TV-PowerOn, TV-Play, AirConditioner-PowerOn
1005	TV-PowerOff, MD-Play

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FIG. 14

No.	Frequent operation pattern
1	TV-PowerOn, TV-Play, AirConditioner-PowerOn
2	TV-PowerOff, MD-Play

FIG. 15

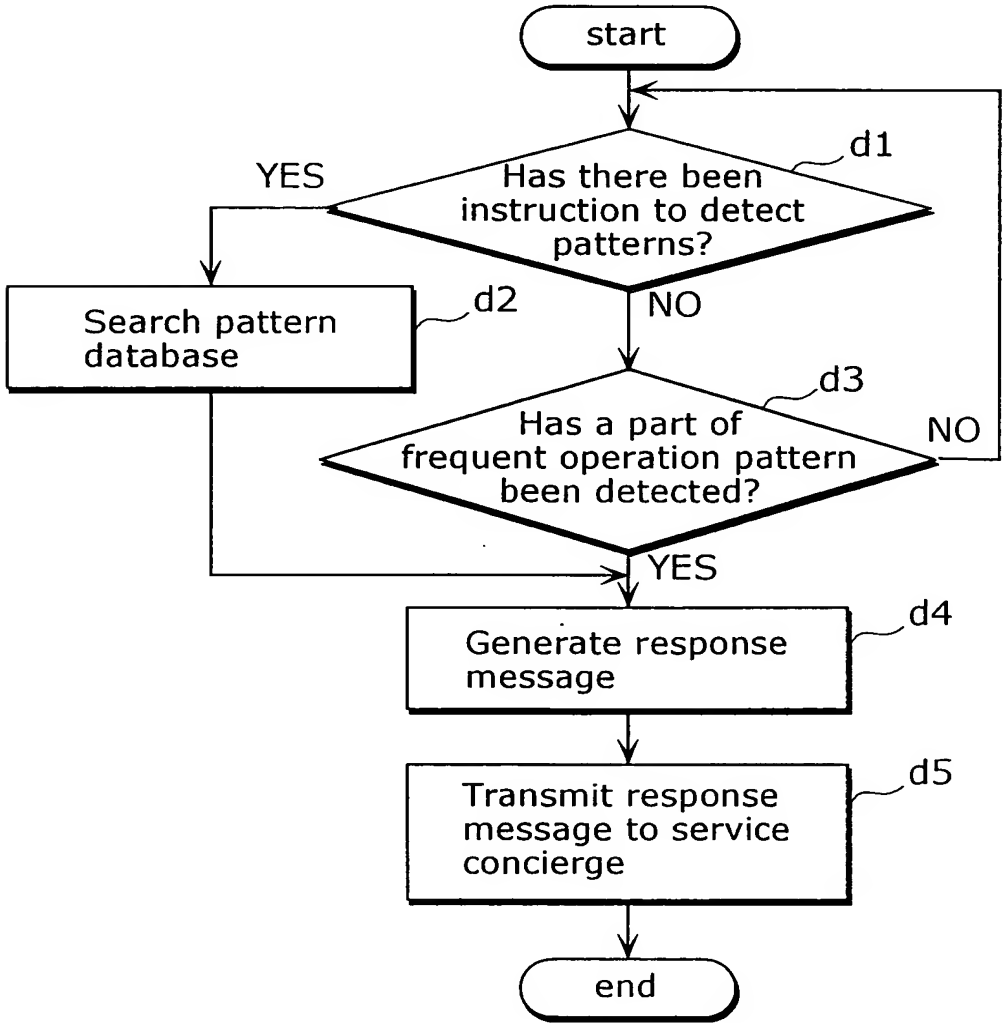


FIG. 16

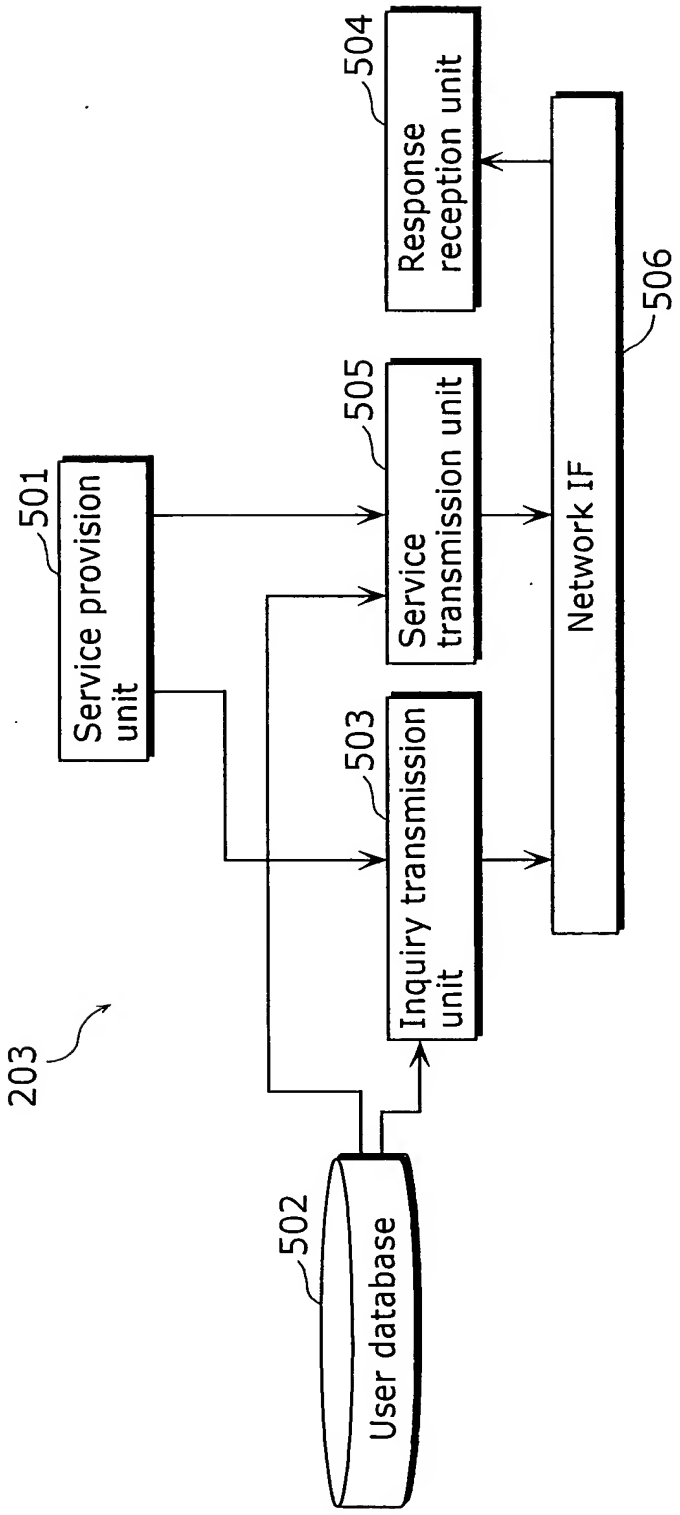

203
501
Service provision unit
502
User database
503
Inquiry transmission unit
504
Response reception unit
505
Service transmission unit
506
Network IF

FIG. 17

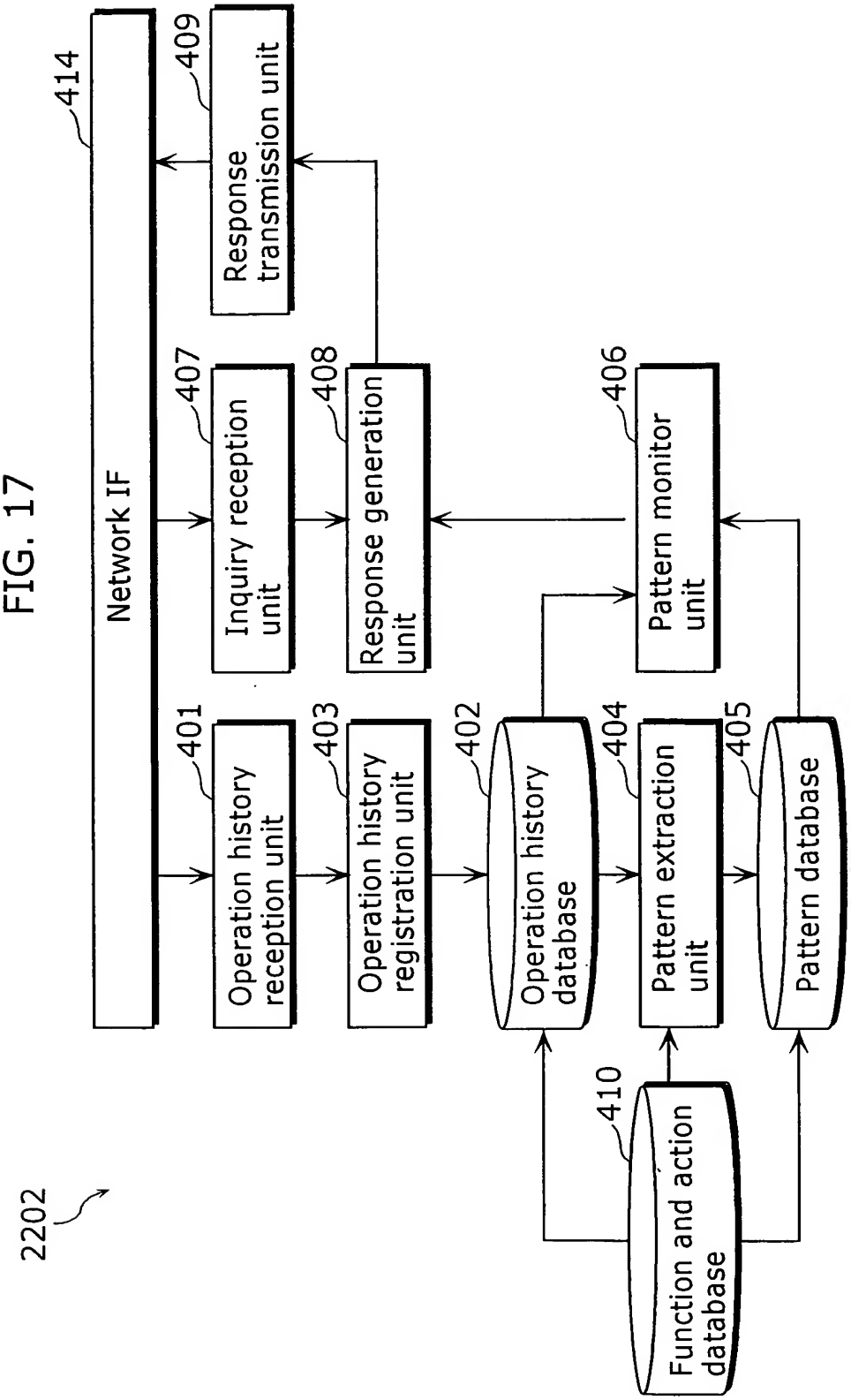

2202
Network IF
414
Response transmission unit
409
Inquiry reception unit
407
Response generation unit
408
Pattern monitor unit
406
Operation history reception unit
401
Operation history registration unit
403
Operation history database
402
Pattern extraction unit
404
Pattern database
405
Function and action database
410

FIG. 18

Device type	Operation type	Operation type specific identifier	Function identifier
TV	PowerOn	PowerOn	Watch
	PowerOff	PowerOff	Stop-Watch
	Change channels	Play	Watch
	...	...	...
VIDEO	Play	Play	Watch
	Stop	Stop	Stop-Watch
	...	...	...
Air Conditioner	PowerOn	PowerOn (25°C or higher)	Cool
	PowerOff	PowerOff (25°C or higher)	Stop-Cool
	Temperature setting	Set(25°C or higher)	Cool
	...	...	...
Fan	PowerOn	PowerOn	Cool
	PowerOff	PowerOff	Stop-Cool
	...	...	...
Radio	PowerOn	PowerOn	Listen
	PowerOff	PowerOff	Stop-Listen
	Select channel	Play	Listen
	...	...	...
MD	Play	Play	Listen
	...	...	...
...	...	...	...

FIG. 19

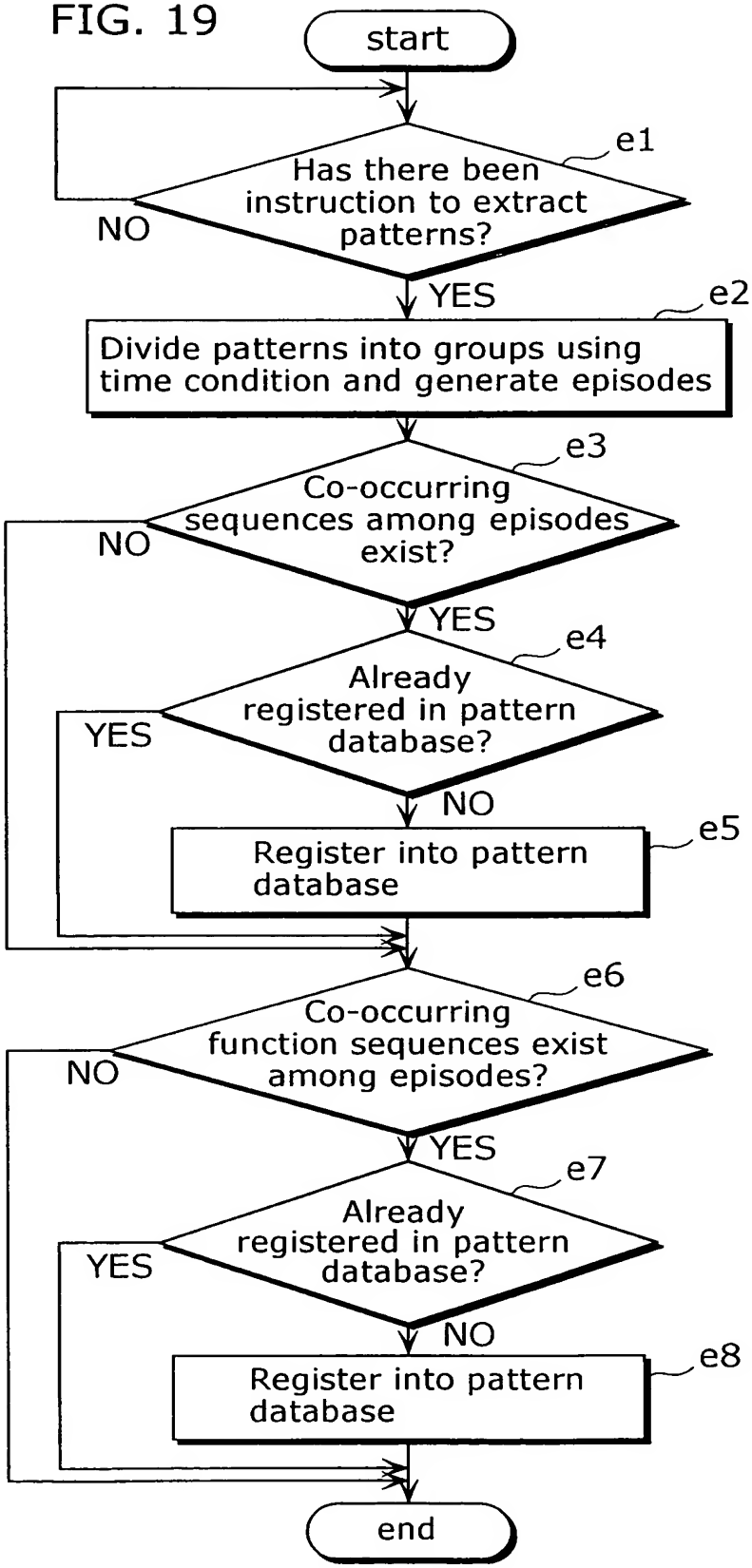
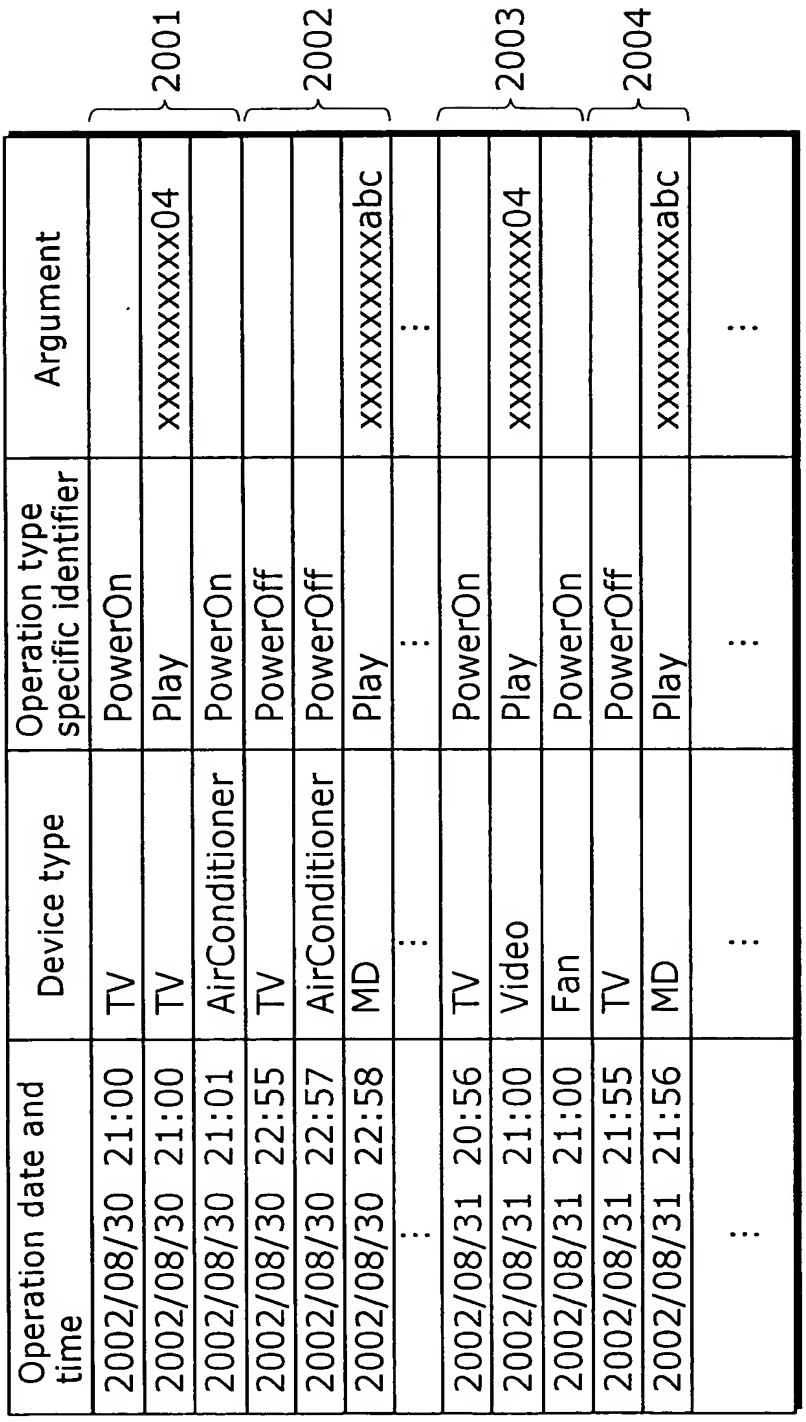

start
e1
Has there been instruction to extract patterns?
NO
YES
e2
Divide patterns into groups using time condition and generate episodes
e3
Co-occurring sequences among episodes exist?
NO
YES
e4
Already registered in pattern database?
YES
NO
e5
Register into pattern database
e6
Co-occurring function sequences exist among episodes?
NO
YES
e7
Already registered in pattern database?
YES
NO
e8
Register into pattern database
end

FIG. 20



Operation date and time	Device type	Operation type specific identifier	Argument	
2002/08/30 21:00	TV	PowerOn		2001
2002/08/30 21:00	TV	Play	xxxxxxxxx04	
2002/08/30 21:01	AirConditioner	PowerOn		
2002/08/30 22:55	TV	PowerOff		2002
2002/08/30 22:57	AirConditioner	PowerOff		
2002/08/30 22:58	MD	Play	xxxxxxxxxabc	
...	...	...	...	
2002/08/31 20:56	TV	PowerOn		2003
2002/08/31 21:00	Video	Play	xxxxxxxxx04	
2002/08/31 21:00	Fan	PowerOn		
2002/08/31 21:55	TV	PowerOff		2004
2002/08/31 21:56	MD	Play	xxxxxxxxxabc	
...	...	...	...	

FIG. 21

Episode	Operation sequence	Function sequence
2001	TV-PowerOn, TV-Play, AirConditioner-PowerOn	Watch, Watch, Cool
2002	TV-PowerOff, AirConditioner-PowerOff, MD-Play	Stop-Watch, Stop-Cool, Listen
2003	TV-PowerOn, Video-Play, Fan-PowerOn	Watch, Watch, Cool
2004	TV-PowerOff, MD-Play	Stop-Watch, Listen

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FIG. 22

No.	Frequent operation pattern
1	TV-PowerOff, MD-Play

FIG. 23

No.	Frequent function pattern
1	Watch, Watch, Cool
2	Stop-Watch, Listen

FIG. 24

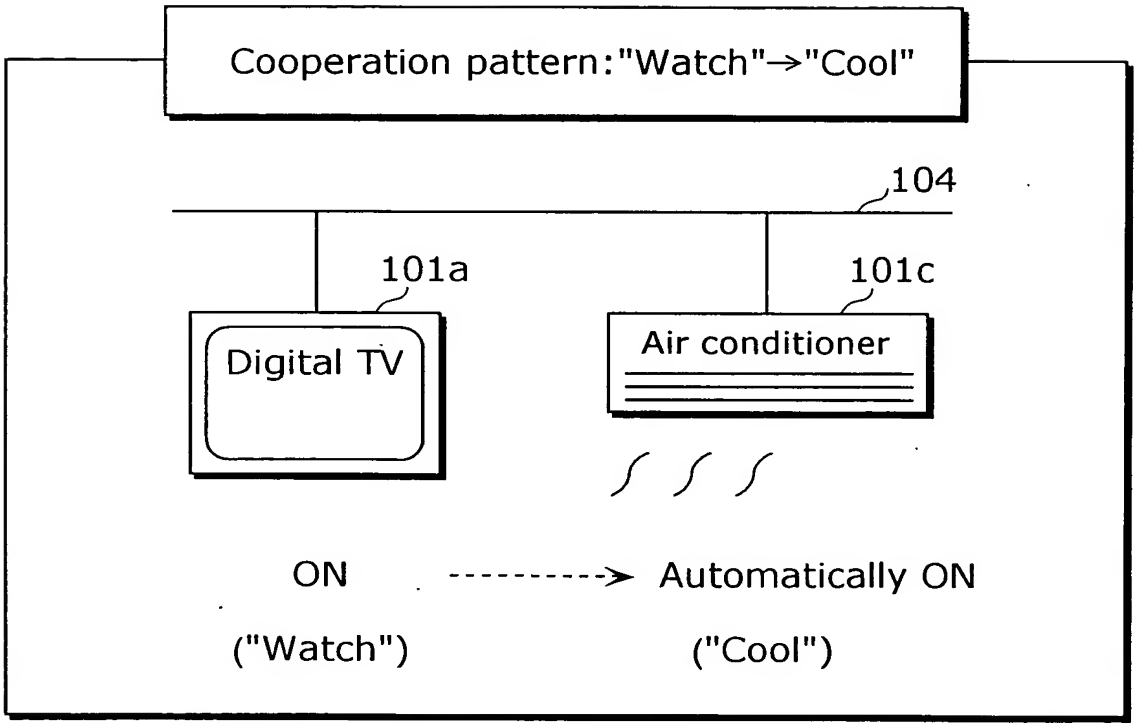

Cooperation pattern:"Watch"→"Cool"
104
101a
101c
Digital TV
Air conditioner
ON
("Watch")
Automatically ON
("Cool")

FIG. 25

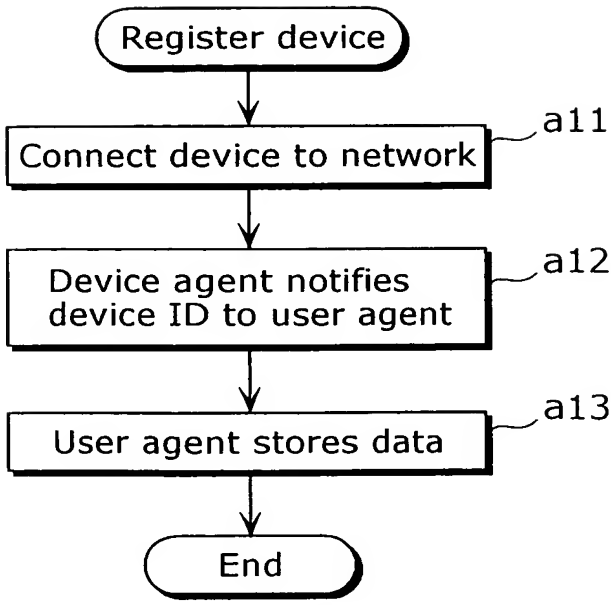

Register device
Connect device to network
a11
Device agent notifies device ID to user agent
a12
User agent stores data
a13
End

FIG. 26

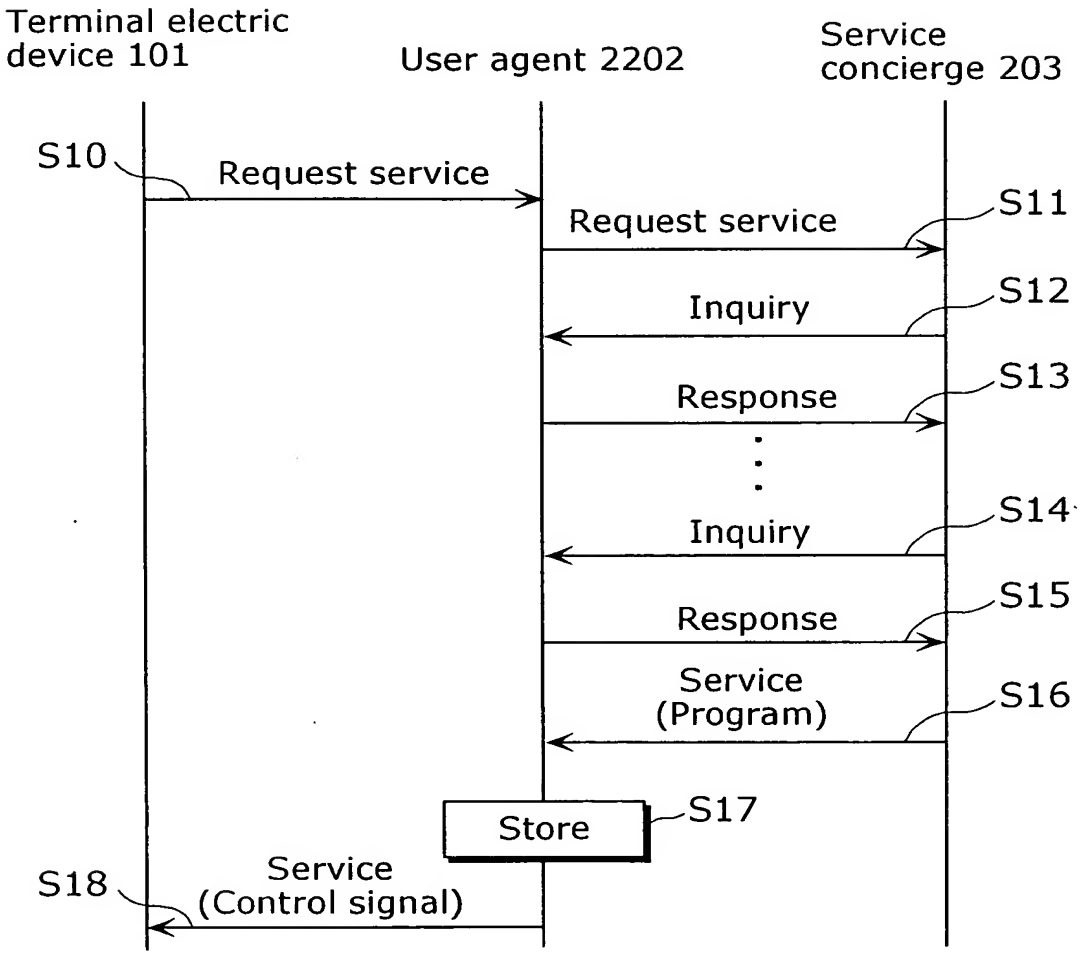

Terminal electric device 101
User agent 2202
Service concierge 203
S10
Request service
Request service
S11
Inquiry
S12
Response
S13
Inquiry
S14
Response
S15
Service (Program)
S16
Store
S17
S18
Service (Control signal)

FIG. 27

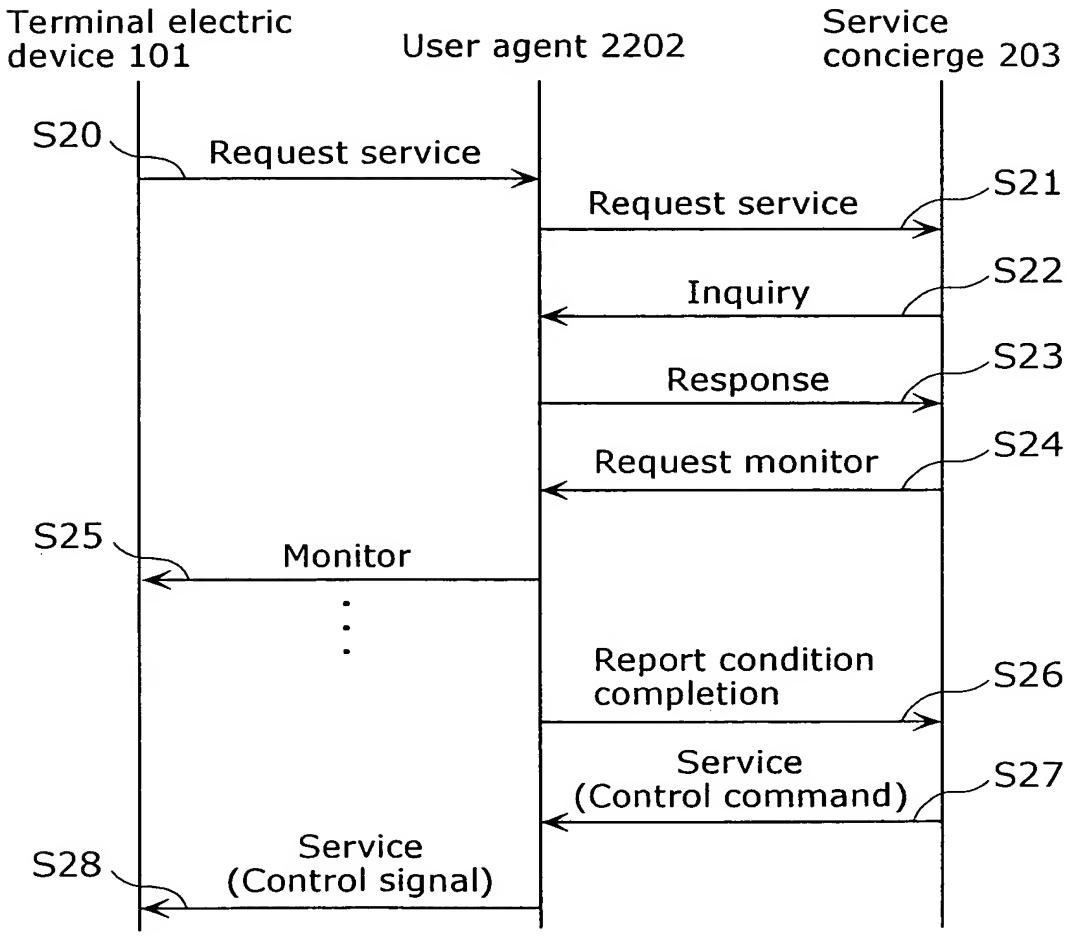

Terminal electric device 101
User agent 2202
Service concierge 203
S20
Request service
Request service
S21
Inquiry
S22
Response
S23
Request monitor
S24
S25
Monitor
Report condition completion
S26
Service (Control command)
S27
S28
Service (Control signal)

FIG. 28

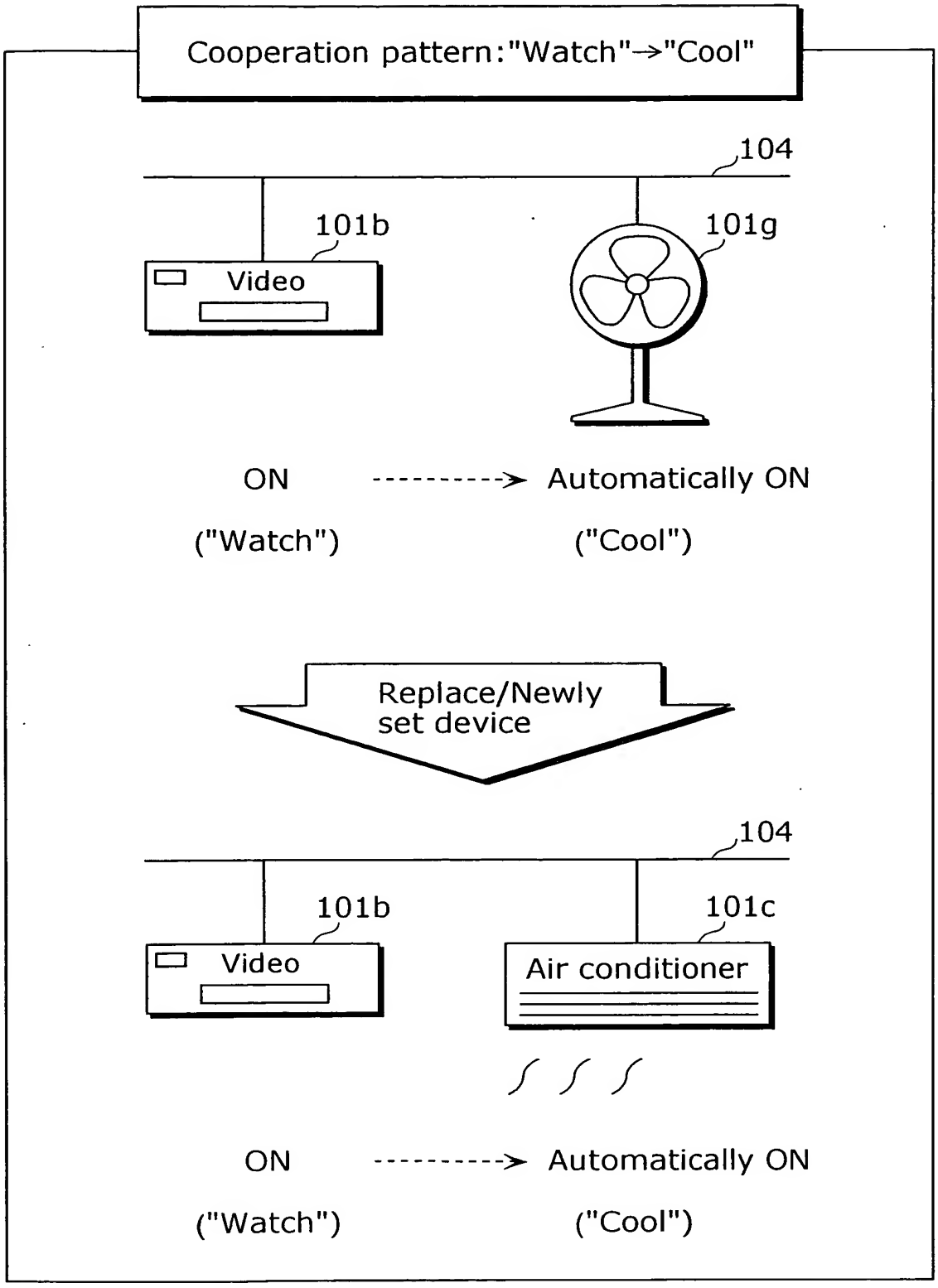

Cooperation pattern:"Watch"→"Cool"
104
101b
Video
101g
ON
("Watch")
Automatically ON
("Cool")
Replace/Newly set device
104
101b
Video
101c
Air conditioner
ON
("Watch")
Automatically ON
("Cool")

FIG. 29

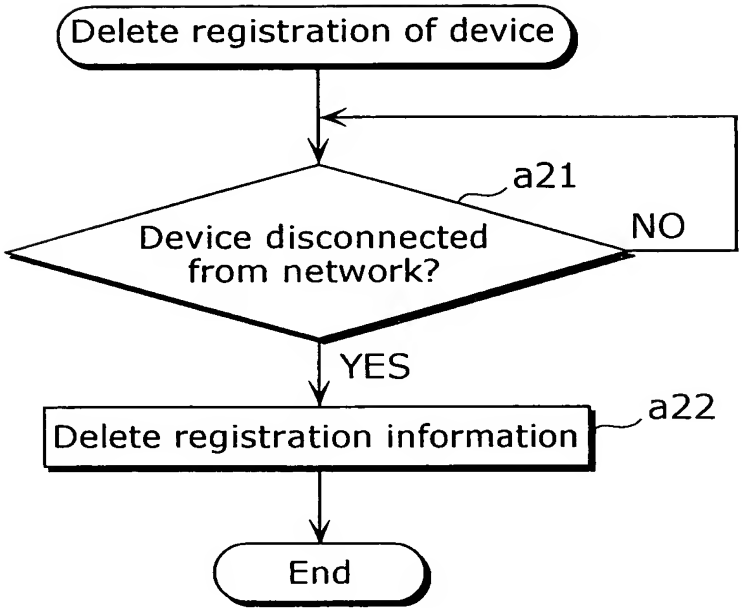

Delete registration of device
a21
Device disconnected from network?
NO
YES
Delete registration information
a22
End

FIG. 30

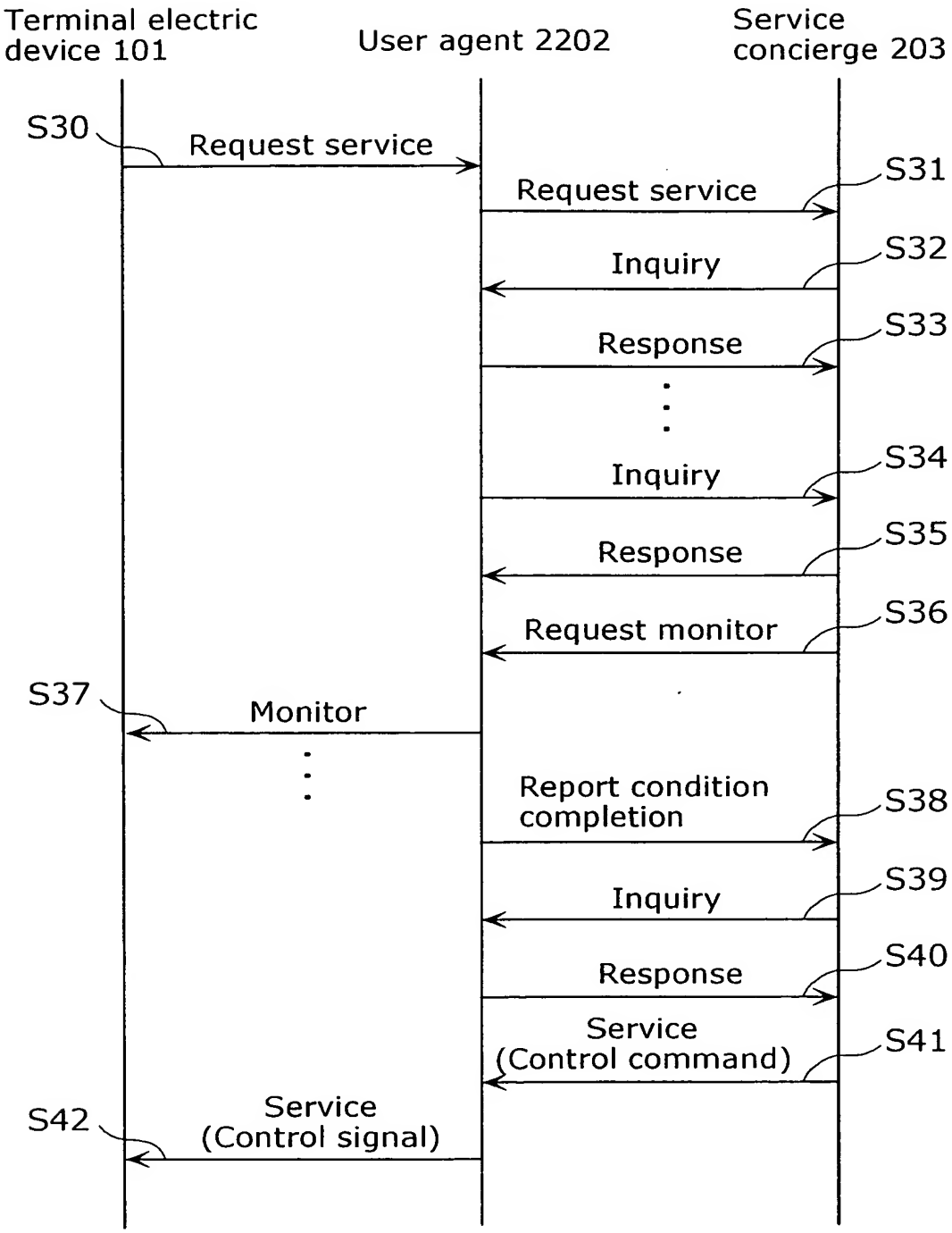

Terminal electric device 101
User agent 2202
Service concierge 203
S30
Request service
Request service
S31
Inquiry
S32
Response
S33
Inquiry
S34
Response
S35
Request monitor
S36
S37
Monitor
Report condition completion
S38
Inquiry
S39
Response
S40
Service (Control command)
S41
S42
Service (Control signal)

FIG. 31

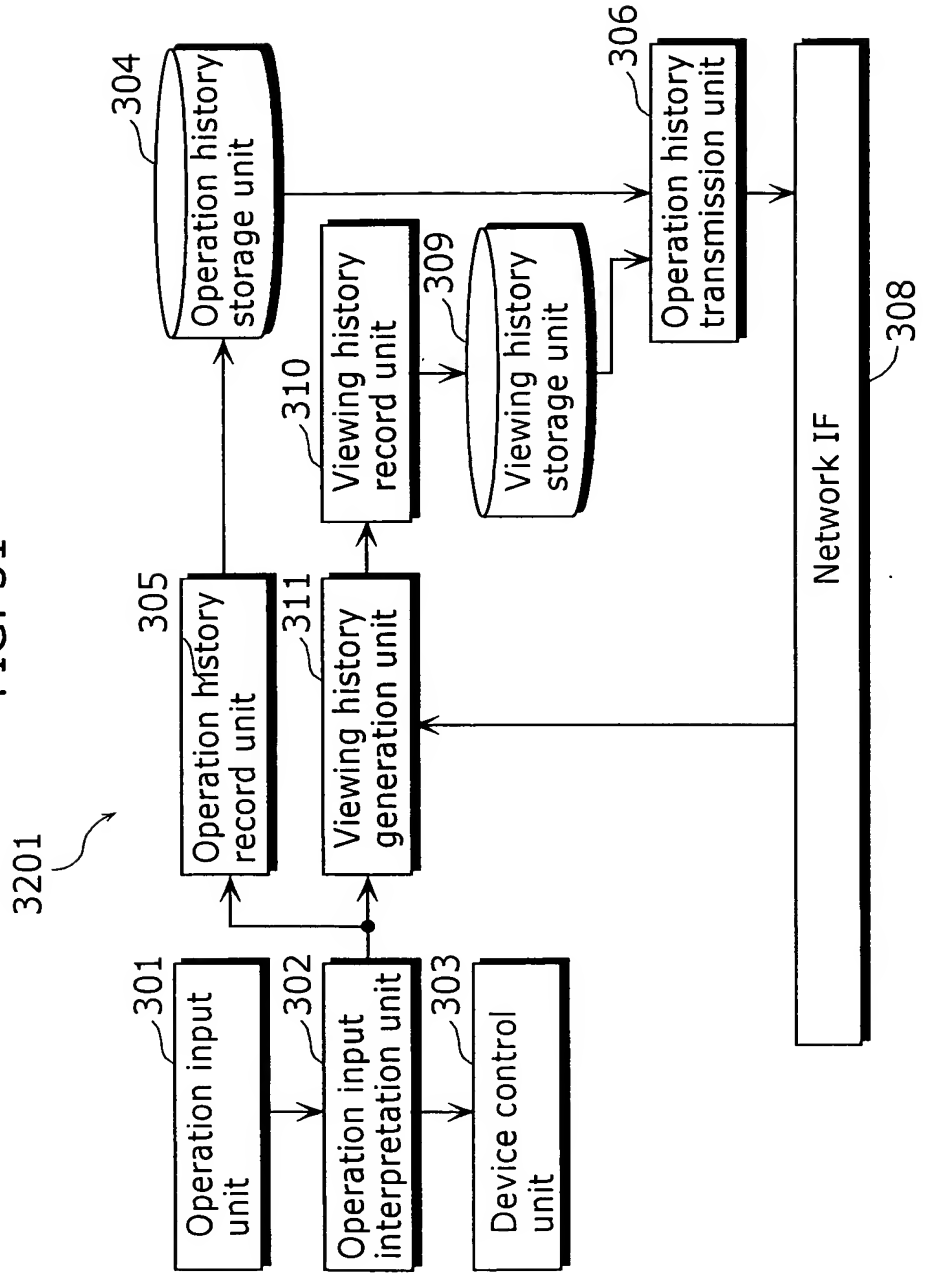

3201
301
Operation input unit
302
Operation input interpretation unit
303
Device control unit
305
Operation history record unit
311
Viewing history generation unit
304
Operation history storage unit
310
Viewing history record unit
309
Viewing history storage unit
306
Operation history transmission unit
308
Network IF

FIG. 32

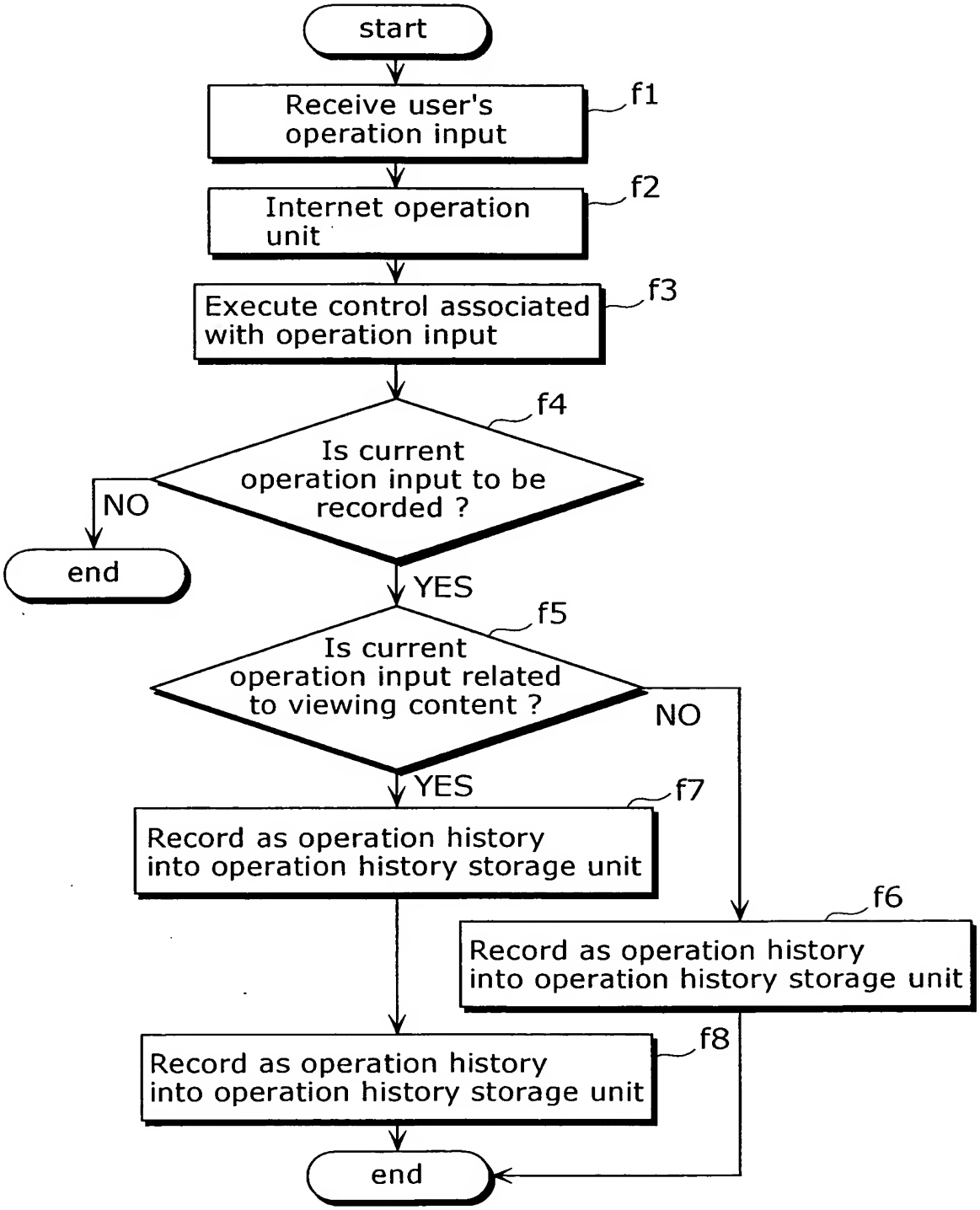

start
Receive user's operation input
f1
Internet operation unit
f2
Execute control associated with operation input
f3
Is current operation input to be recorded ?
f4
NO
end
YES
Is current operation input related to viewing content ?
f5
NO
YES
Record as operation history into operation history storage unit
f7
Record as operation history into operation history storage unit
f6
Record as operation history into operation history storage unit
f8
end

FIG. 33

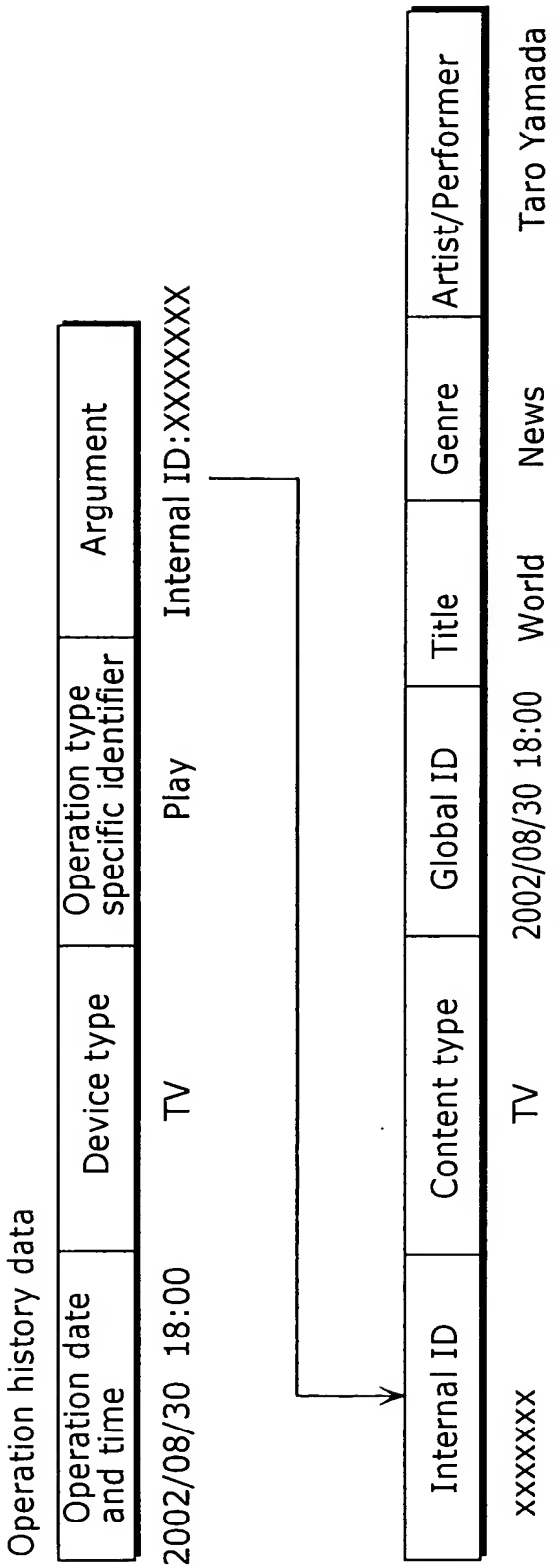

Operation history data
Operation date and time
Device type
Operation type specific identifier
Argument
2002/08/30 18:00
TV
Play
Internal ID:XXXXXX
Internal ID
Content type
Global ID
Title
Genre
Artist/Performer
xxxxxx
TV
2002/08/30 18:00 BS101
World news
News
Taro Yamada
Viewing history data

FIG. 34

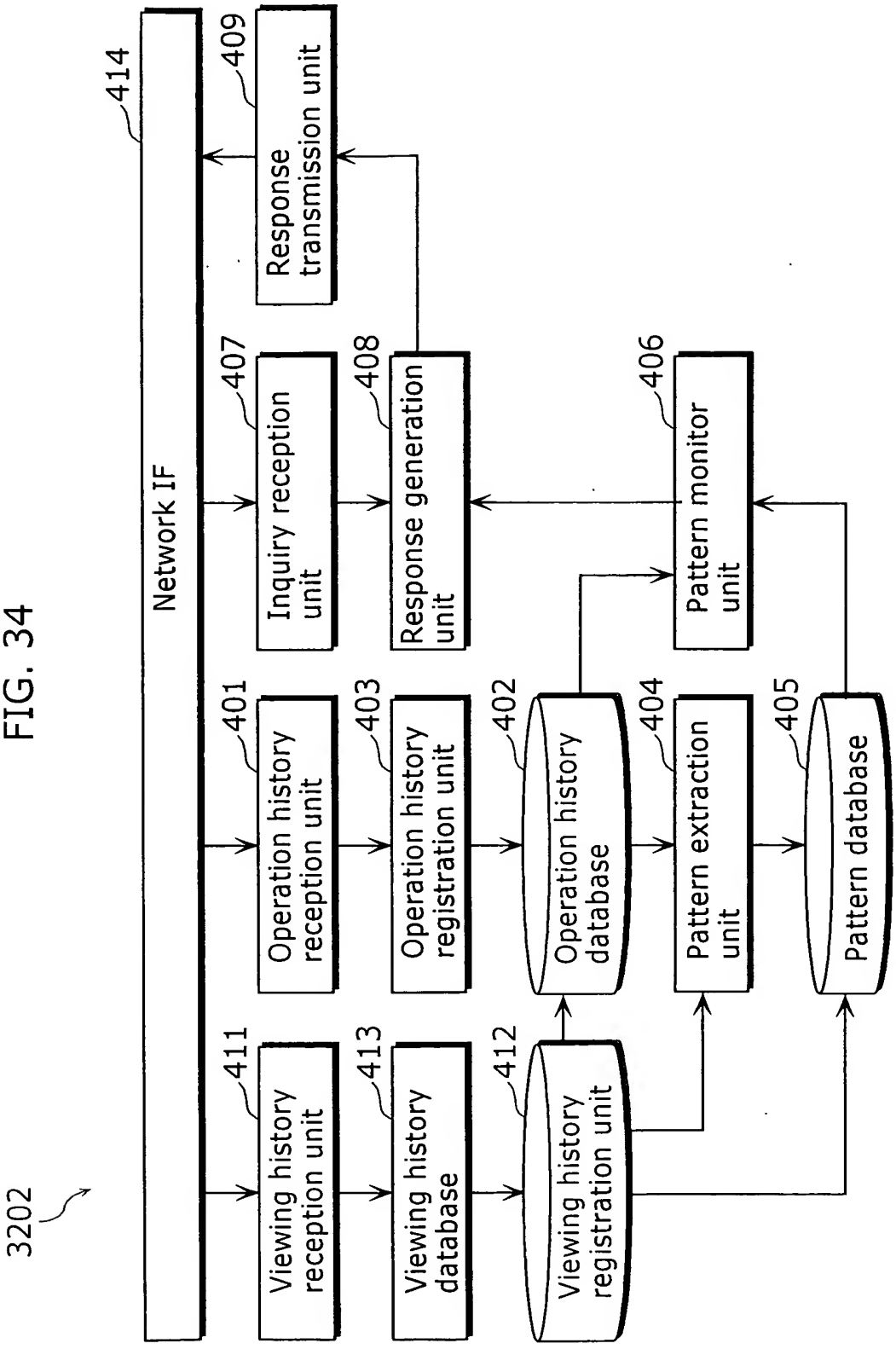
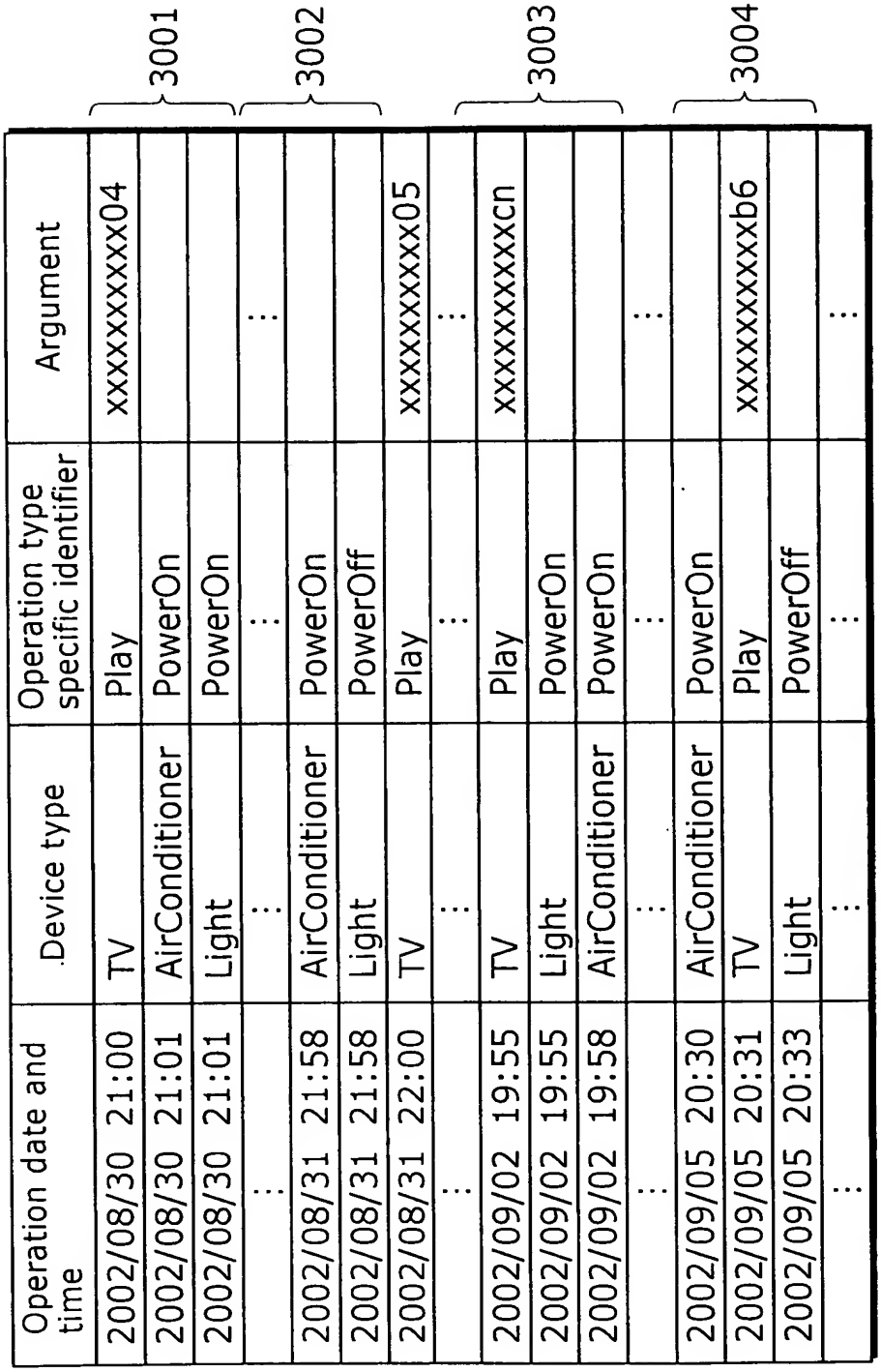

3202
Network IF
414
Response transmission unit
409
Inquiry reception unit
407
Response generation unit
408
Pattern monitor unit
406
Operation history reception unit
401
Operation history registration unit
403
Operation history database
402
Pattern extraction unit
404
Pattern database
405
Viewing history reception unit
411
Viewing history database
413
Viewing history registration unit
412

FIG. 35



Operation date and time	Device type	Operation type specific identifier	Argument	
2002/08/30 21:00	TV	Play	xxxxxxxxx04	3001
2002/08/30 21:01	AirConditioner	PowerOn		
2002/08/30 21:01	Light	PowerOn		3002
...	...	...	...	
2002/08/31 21:58	AirConditioner	PowerOn		
2002/08/31 21:58	Light	PowerOff		
2002/08/31 22:00	TV	Play	xxxxxxxxx05	3003
...	...	...	...	
2002/09/02 19:55	TV	Play	xxxxxxxxxcn	
2002/09/02 19:55	Light	PowerOn		
2002/09/02 19:58	AirConditioner	PowerOn		3004
...	...	...	...	
2002/09/05 20:30	AirConditioner	PowerOn		
2002/09/05 20:31	TV	Play	xxxxxxxxxb6	
2002/09/05 20:33	Light	PowerOff		
...	...	...	...	

FIG. 36

Internal ID	Content type	Global ID	Title	Genre	Artist/Performer
xxxxxxxxxx04	TV	2002/08/30 21:00 BS101	Season of sun	Drama	Tatsuo Hujihara
xxxxxxxxxx05	TV	2002/08/31 22:00 BS113	Romance 2000	Movie	Bill Jobs
xxxxxxxxxxcn	TV	2002/09/02 19:55 BS192	News 20	News	Hiroshi kume
xxxxxxxxxxb6	TV	2002/09/05 20:31 BS163	Happy day	Movie	Steve Gates
⋮	⋮	⋮	⋮	⋮	⋮

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FIG. 37

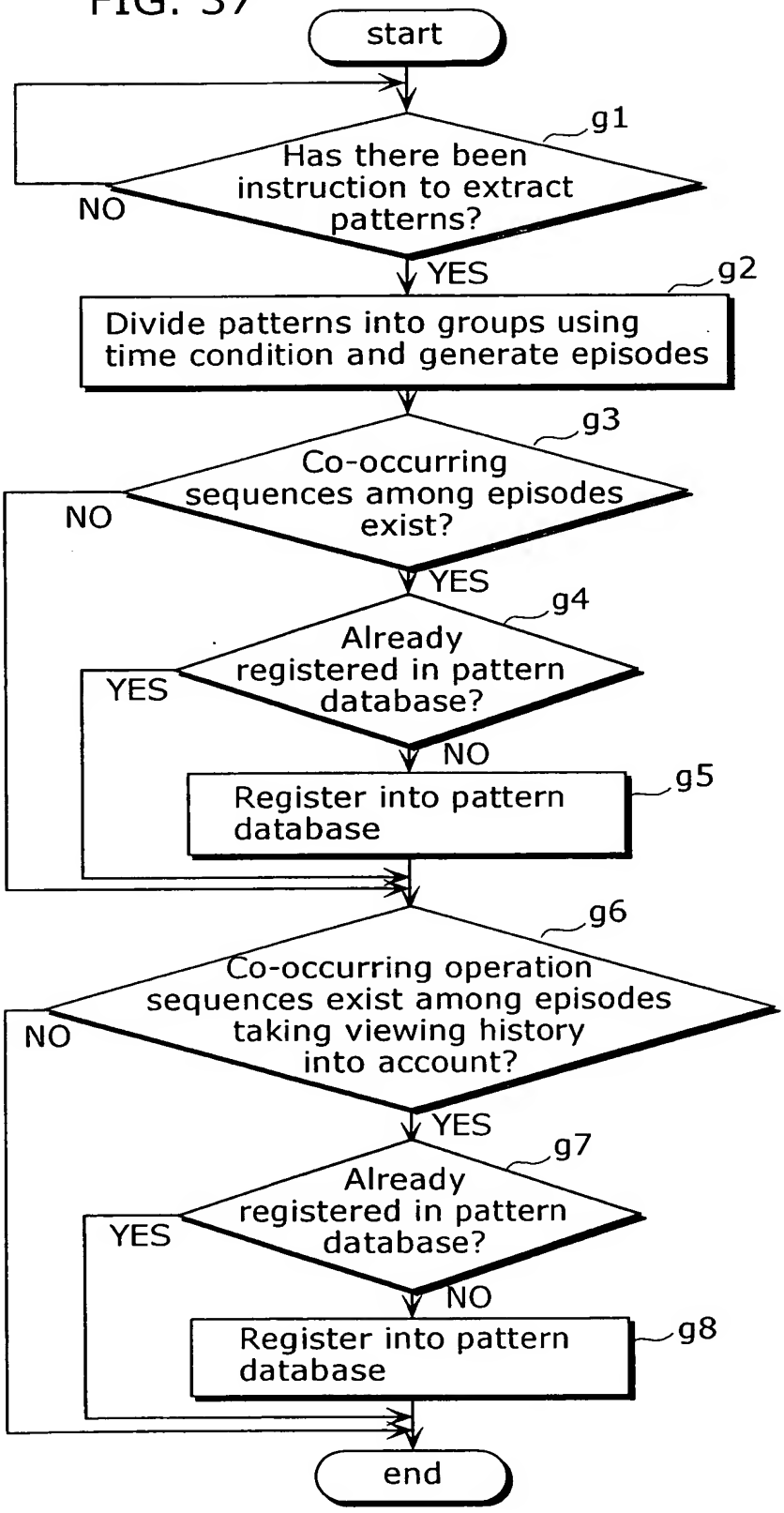
start
g1
Has there been instruction to extract patterns?
NO
YES
g2
Divide patterns into groups using time condition and generate episodes
g3
Co-occurring sequences among episodes exist?
NO
YES
g4
Already registered in pattern database?
YES
NO
g5
Register into pattern database
g6
Co-occurring operation sequences exist among episodes taking viewing history into account?
NO
YES
g7
Already registered in pattern database?
YES
NO
g8
Register into pattern database
end

FIG. 38

Episode	Operation sequence
3001	TV-Play, AirConditioner-PowerOn, Light-PowerOn
3002	AirConditioner-PowerOn, Light-PowerOff, TV-Play
3003	TV-Play, Light-PowerOn, AirConditioner-PowerOn
3004	AirConditioner-PowerOn, TV-Play, Light-PowerOff

FIG. 39

No.	Frequent operation pattern
1	TV-Play, AirConditioner-PowerOn, Light-PowerOn
2	TV-Play, AirConditioner-PowerOn, Light-PowerOff
3	TV-Play, AirConditioner-PowerOn

FIG. 40

Episode	Operation sequence
3001	TV-Drama, AirConditioner-PowerOn, Light-PowerOn
3002	AirConditioner-PowerOn, Light-PowerOff, TV-Movie
3003	TV-News, Light-PowerOn, AirConditioner-PowerOn
3004	AirConditioner-PowerOn, TV-Movie, Light-PowerOff

FIG. 41

No.	Frequent operation pattern
1	AirConditioner-PowerOn, Light-PowerOn
2	TV-Movie, AirConditioner-PowerOn, Light-PowerOff

FIG. 42

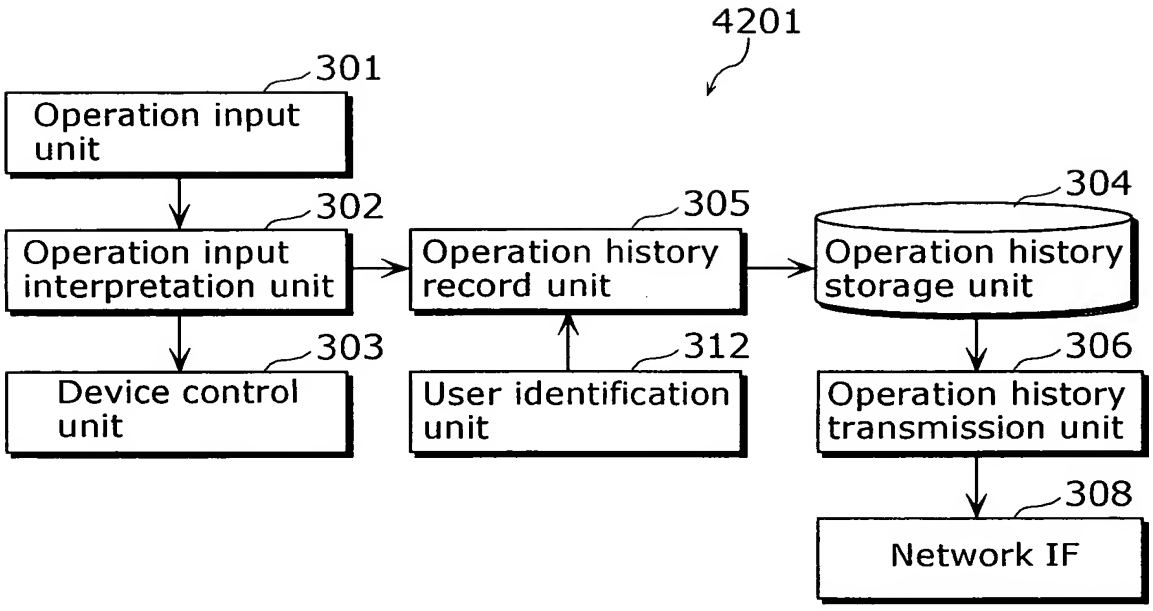
4201
301
Operation input unit
302
Operation input interpretation unit
303
Device control unit
305
Operation history record unit
312
User identification unit
304
Operation history storage unit
306
Operation history transmission unit
308
Network IF

FIG. 43

Operation date and time	User ID	Device type	Operation type specific identifier	Argument
2002/08/29 11:00	abc123xxxxx	Air Conditioner	Set	27

FIG. 44

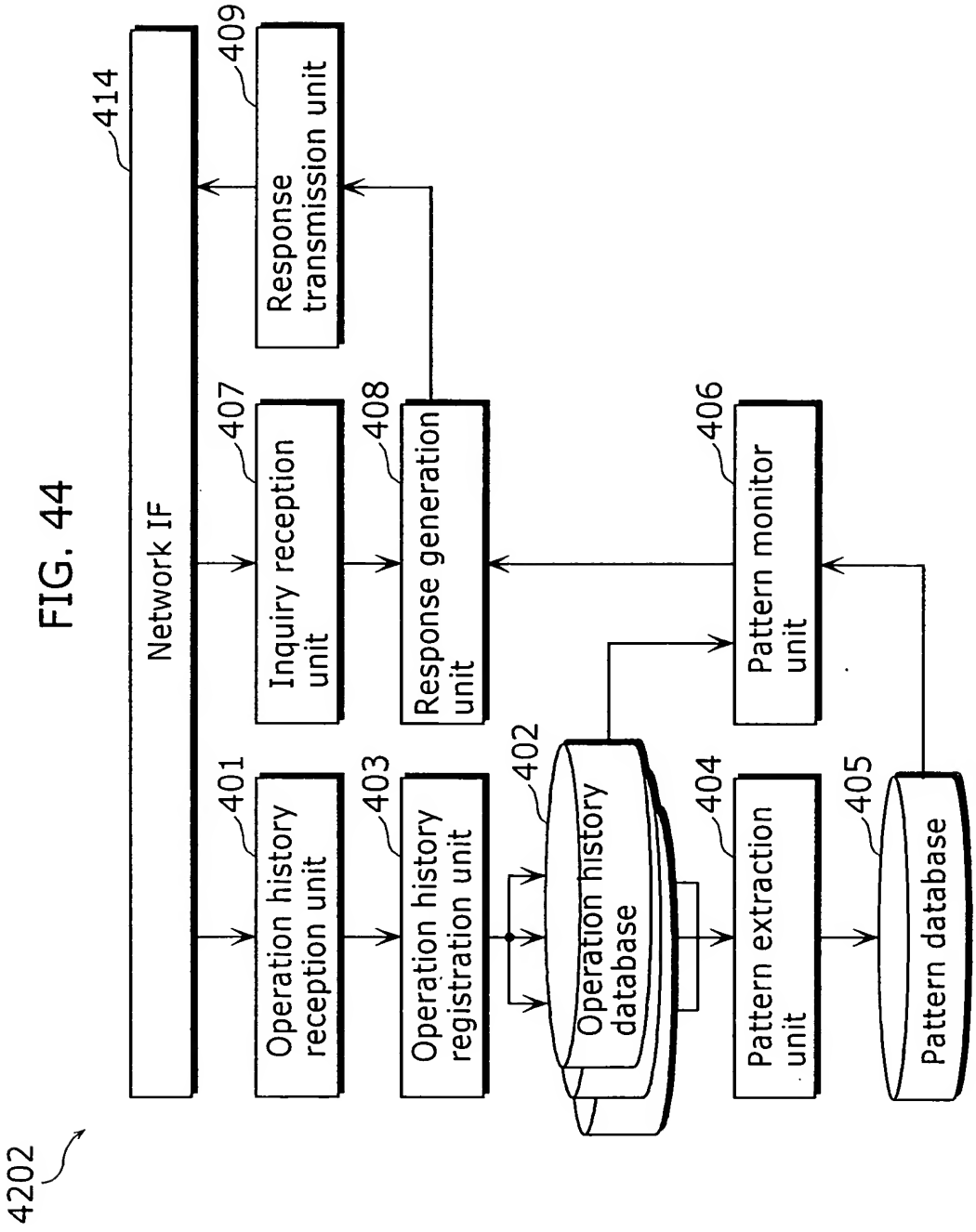
4202
Network IF
414
Response transmission unit
409
Inquiry reception unit
407
Response generation unit
408
Pattern monitor unit
406
Operation history reception unit
401
Operation history registration unit
403
Operation history database
402
Pattern extraction unit
404
Pattern database
405

FIG. 45

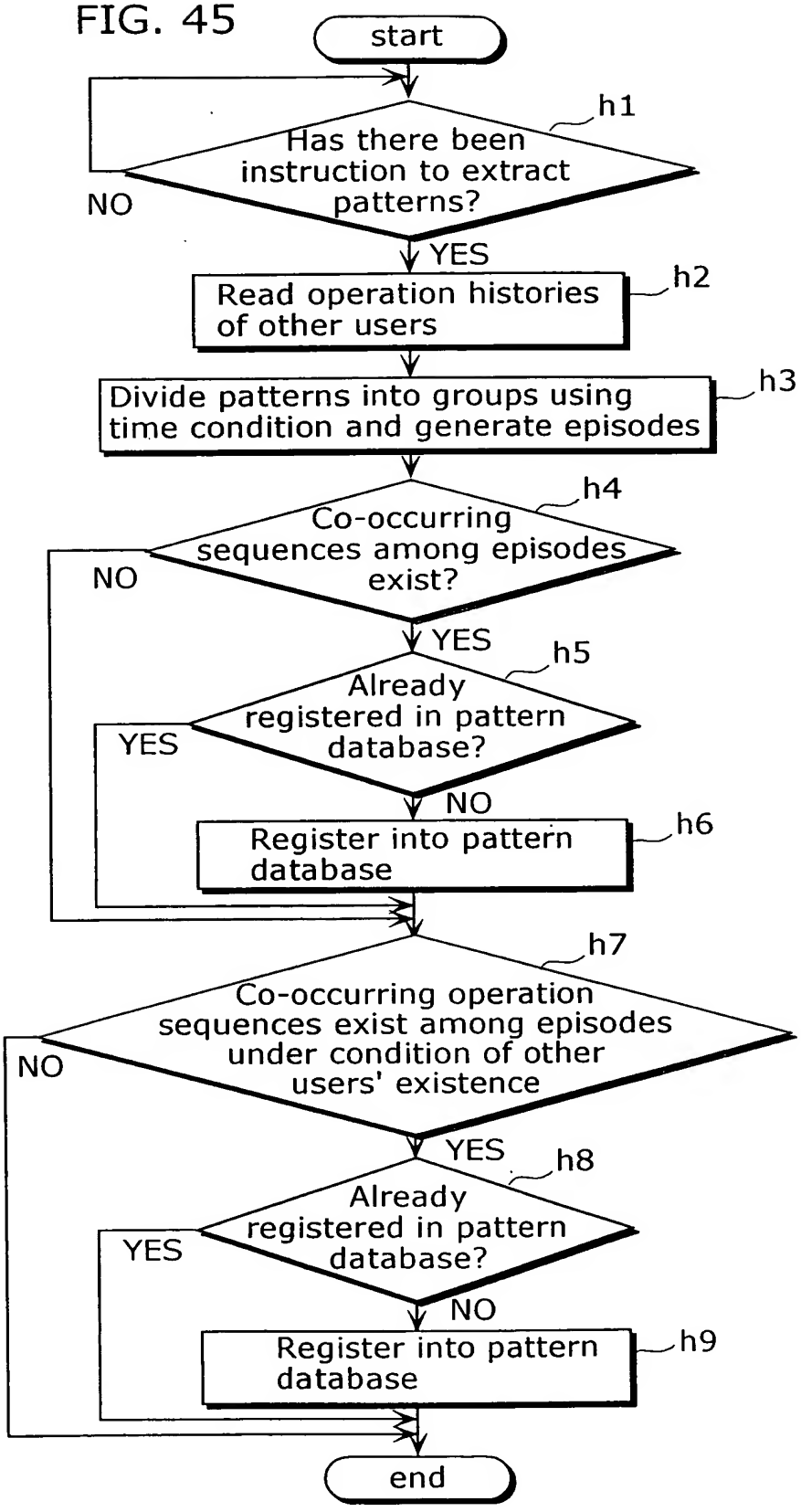
start
h1
Has there been instruction to extract patterns?
NO
YES
h2
Read operation histories of other users
h3
Divide patterns into groups using time condition and generate episodes
h4
Co-occurring sequences among episodes exist?
NO
YES
h5
Already registered in pattern database?
YES
NO
h6
Register into pattern database
h7
Co-occurring operation sequences exist among episodes under condition of other users' existence
NO
YES
h8
Already registered in pattern database?
YES
NO
h9
Register into pattern database
end

FIG. 46

Operation date and time	User ID	Device type	Operation type specific identifier	Argument	
2002/08/30 21:00	abc123xxx	TV	PowerOn		4001
2002/08/30 21:00	abc123xxx	TV	Play	xxxxxxxxxx04	
2002/08/30 21:01	abc123xxx	AirConditioner	PowerOn		
2002/08/30 21:03	def457yyy	Radio	PowerOff		
2002/08/30 21:03	abc123xxx	Light	PowerOn		
⋮	⋮	⋮	⋮	⋮	
2002/08/31 20:56	abc123xxx	TV	PowerOn		4002
2002/08/31 21:00	abc123xxx	AirConditioner	PowerOn		
⋮	⋮	⋮	⋮	⋮	
2002/09/01 19:00	abc123xxx	TV	PowerOn		4003
2002/09/01 19:00	abc123xxx	Light	PowerOn		
2002/09/01 19:01	abc123xxx	AirConditioner	PowerOn		
2002/09/01 19:01	def457yyy	MD	Stop		
⋮	⋮	⋮	⋮	⋮	
2002/09/03 21:58	abc123xxx	AirConditioner	PowerOn		4004
2002/09/03 22:00	abc123xxx	TV	PowerOn		
2002/09/03 22:00	abc123xxx	TV	Play	xxxxxxxxxxabc	
⋮	⋮	⋮	⋮	⋮	

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FIG. 47

Episode	Operation sequence	Other users who existed
4001	TV-PowerOn, TV-Play, AirConditioner-PowerOn, Light-PowerOn	def457yyy
4002	TV-PowerOn, AirConditioner-PowerOn	
4003	TV-PowerOn, Light-PowerOn, AirConditioner-PowerOn	def457yyy
4004	AirConditioner-PowerOn, TV-PowerOn, TV-Play	

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FIG. 48

No.	Frequent operation pattern
1	TV-PowerOn, AirConditioner-PowerOn, Light-PowerOn
2	TV-PowerOn, AirConditioner-PowerOn

FIG. 49

No.	Frequent operation pattern	Other users who existed
1	TV-PowerOn, AirConditioner -PowerOn, Light-PowerOn	def457yyy
2	TV-PowerOn, AirConditioner -PowerOn	

FIG. 50

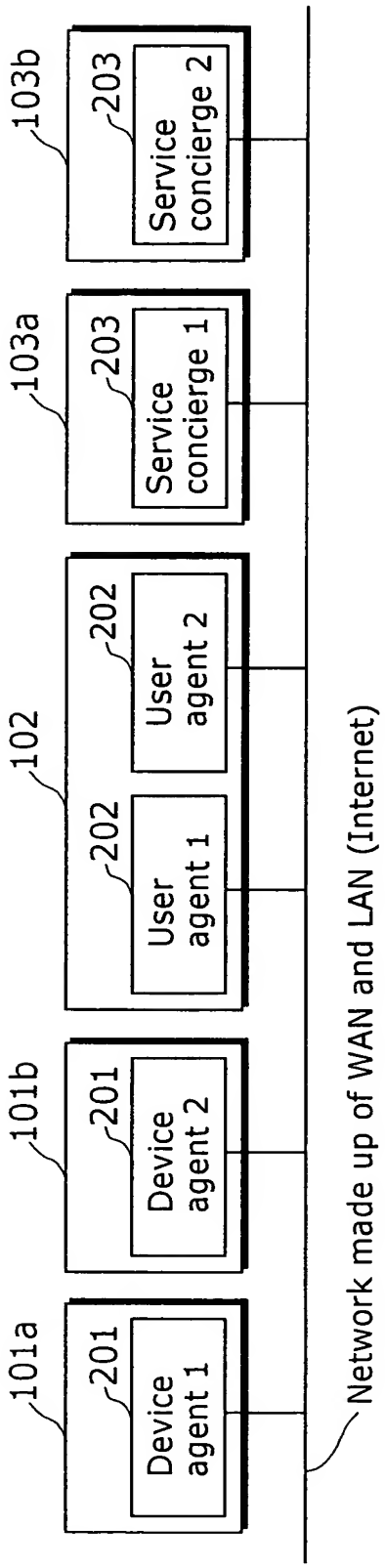
101a
201
Device agent 1
101b
201
Device agent 2
102
202
User agent 1
202
User agent 2
103a
203
Service concierge 1
103b
203
Service concierge 2
Network made up of WAN and LAN (Internet)

FIG. 51

Operation date and time	Device type	Operation type specific identifier	Argument	
2002/09/28 13:32	Tel	Call	06-1111-2222	5001
2002/09/28 13:35	CD	Play	ID:abc123456	
⋮	⋮	⋮	⋮	
2002/09/29 18:11	Tel	Call	03-1234-5678	5002
2002/09/29 18:15	OvenRange	PowerOn		
⋮	⋮	⋮	⋮	
2002/09/30 16:21	Tel	Call	03-1234-5678	5003
2002/09/30 16:25	OvenRange	PowerOn		
⋮	⋮	⋮	⋮	
2002/10/01 11:41	Tel	Call	06-1111-2222	5004
2002/10/01 11:43	CD	Play	ID:def98765	
⋮	⋮	⋮	⋮	

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FIG. 52

Episode	Operation sequence
	Tel-Call, CD-Play
	Tel-Call, OvenRange-PowerOn
	Tel-Call, OvenRange-PowerOn
	Tel-Call, CD-Play

FIG. 53

No.	Frequent operation pattern
1	Tel-Call ,CD-Play
2	Tel-Call, OvenRange-PowerOn

FIG. 54

Episode	Operation sequence
5001	Tel-Call-0611112222, CD-Play
5002	Tel-Call-0312345678, OvenRange-PowerOn
5003	Tel-Call-0312345678, OvenRange-PowerOn
5004	Tel-Call-0611112222, CD-Play

FIG. 55

No.	Frequent operation pattern
1	Tel-Call-0611112222, CD-Play
2	Tel-Call-0312345678, OvenRange-PowerOn

FIG. 56

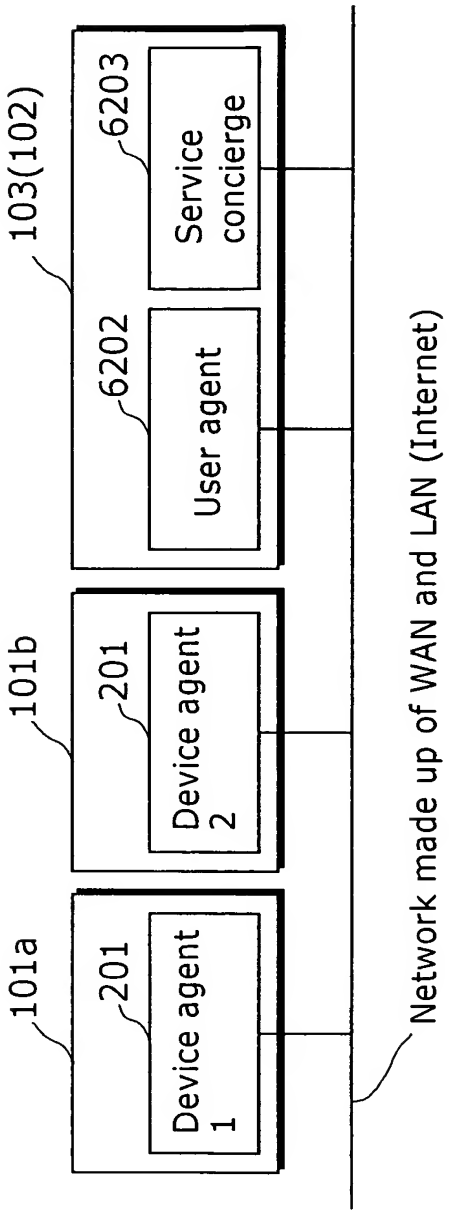

101a
201
Device agent 1
101b
201
Device agent 2
103(102)
6202
User agent
6203
Service concierge
Network made up of WAN and LAN (Internet)

FIG. 57

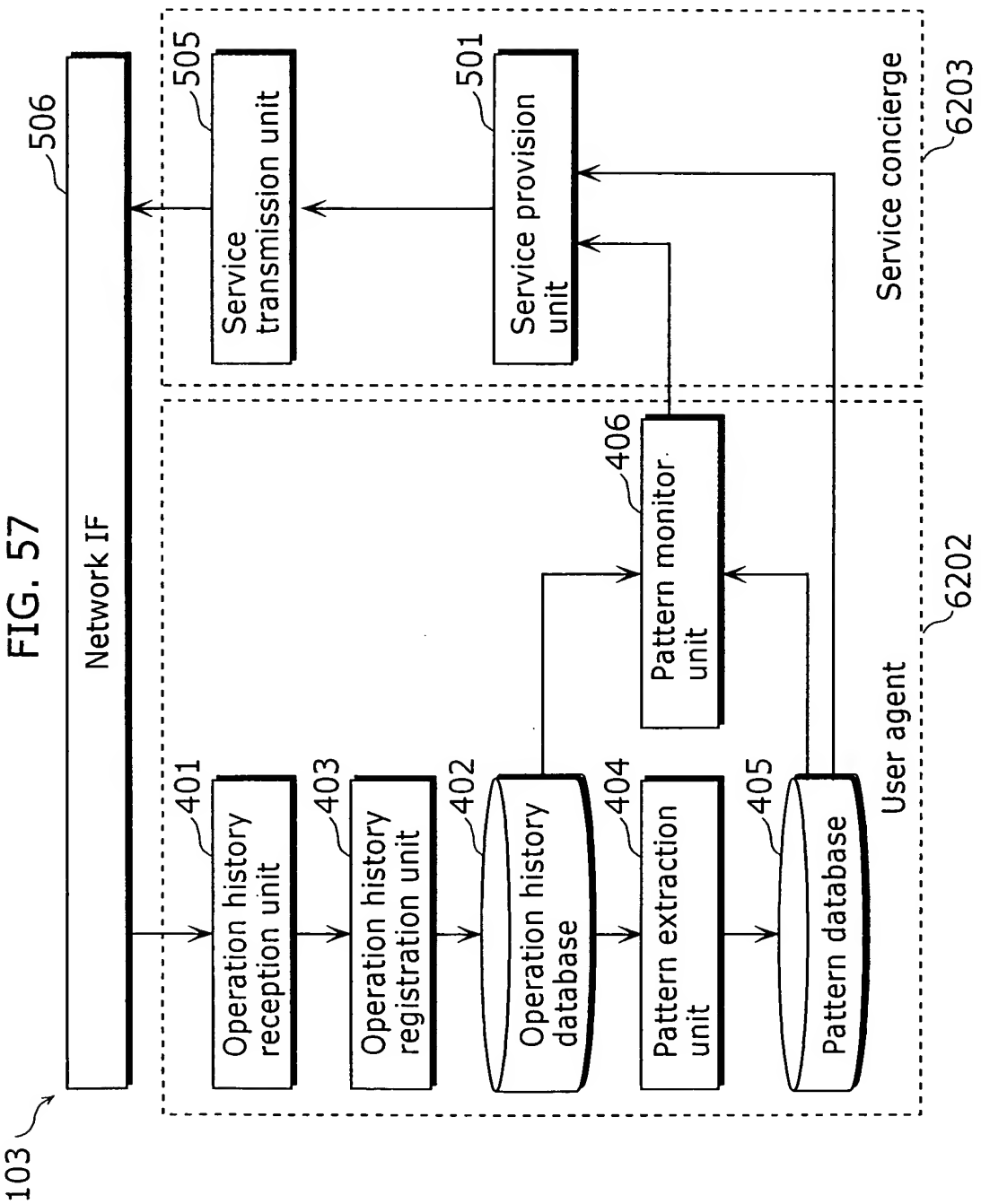

103
Network IF
506
505
Service transmission unit
501
Service provision unit
Service concierge
6203
406
Pattern monitor unit
6202
401
Operation history reception unit
403
Operation history registration unit
402
Operation history database
404
Pattern extraction unit
405
Pattern database
User agent

FIG. 58

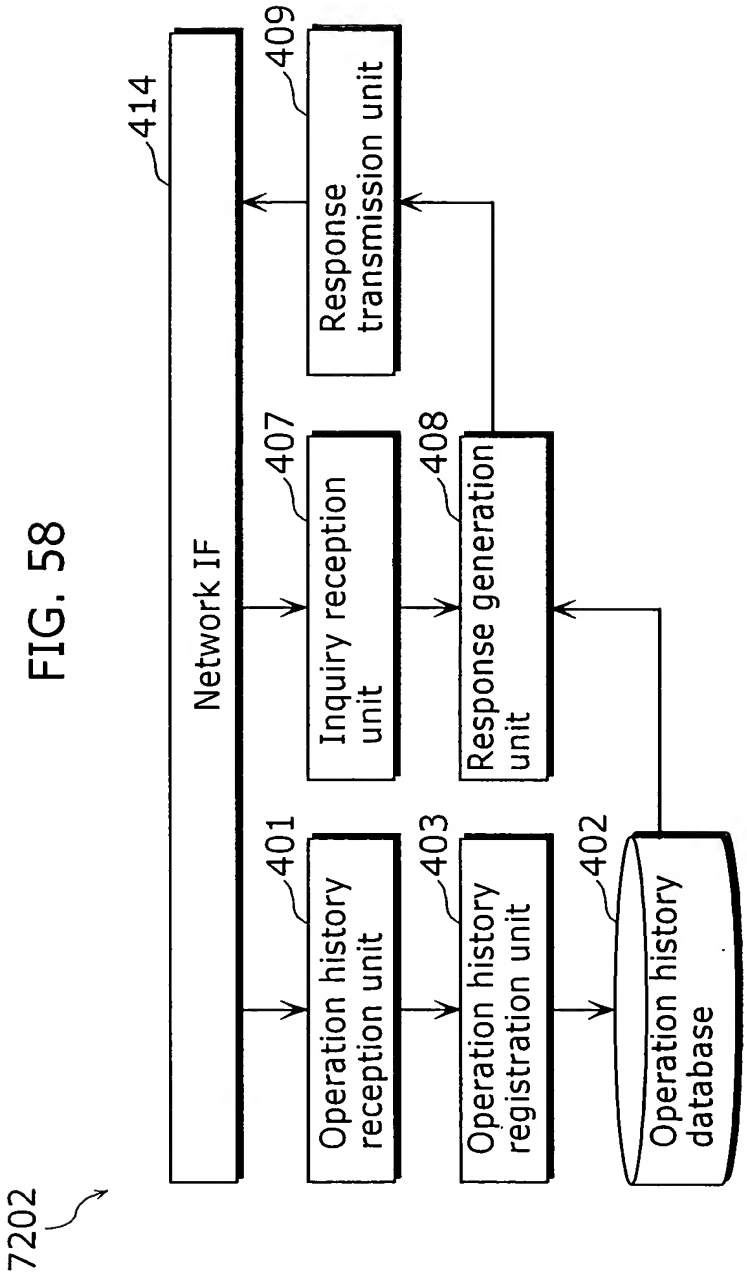
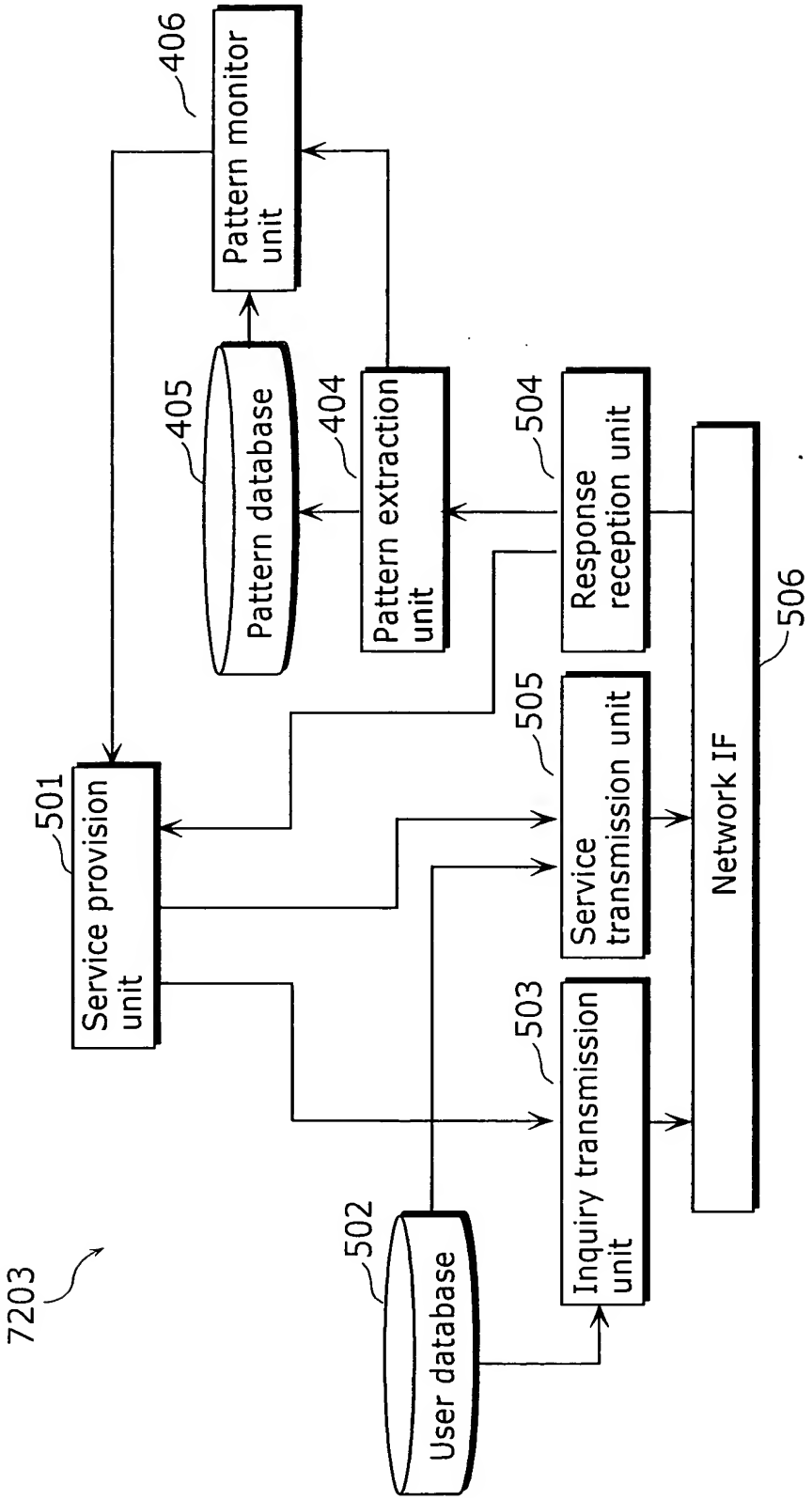

7202
414
Network IF
409
Response transmission unit
407
Inquiry reception unit
408
Response generation unit
401
Operation history reception unit
403
Operation history registration unit
402
Operation history database

FIG. 59


7203
Service provision unit
501
User database
502
Inquiry transmission unit
503
Service transmission unit
505
Response reception unit
504
Pattern extraction unit
404
Pattern database
405
Pattern monitor unit
406
Network IF
506